B.Sc. I Year
BOTANY 2015

THEORY

Course	Nomenclature	Number of Papers	Number of Periods per week	Maximum marks	Minimum marks
Paper I	Algae, Lichens and Bryophytes	1	2	50	
Paper II	Mycology, Microbiology and Phytopathology	1	2	50	54
Paper III	Palaeobotany, Pteridophytes and Gymnosperms	1	2	50	
PRACTICAL COURSE			6	75	27

Duration of examination of each theory papers   3 hours
Duration of examination of practicals   5 hours

PAPER – I
ALGAE, LICHENS AND BRYOPHYTES

Unit 1: General characters, Classification and economic importance of Algae. Important features and life history of Chlorophyceace and Charophyceae. Structure and life cycle of *Volvox, Oedogonium*, *Coleochaete* and *Chara*.

Unit 2: Important features and life history of Xanthophyceae and Phaeophyceae. Structure and life cycle of *Vaucheria*, *Ectocarpus* and *Sargassum*.

Unit 3: Important Features and life history of Rhodophyceae. Structure and life cycle of *Polysiphonia*. Lichens: Morphology and structure of the two components; biological, ecological and economic importance.Vegetative multiplication methods with special reference to *Parmelia* and *Usnea*.

Unit 4: Bryophytes: General characters, alternation of generations and classification.Characters and Classification of Hepaticopsida. Morphology and life history of *Riccia, Marchantia* and *Plagiochasma*.

Unit 5: Characters and classification of Anthocerotopsida and Bryopsida. Morphology and life history of *Anthoceros* and *Sphagnum*.

SUGGESTED LABORATORY EXERCISES

Algae: Microscopic preparation and study of following algal materials: *Volvox, Oedogonium, Coleochaete, Vaucheria, Chara, Ectocarpus, Sargassum* and *Polysiphonia*

Lichens: Study of Lichens

Bryophytes: Study of external morphology and microscopic preparations of following Bryophytes: *Riccia*, Marchantia*, Plagiochasma, Anthoceros* and *Sphagnum*

SUGGESTED READINGS

Bold, H.C., Alexopoulous, C.J. and Delevoryas, T. Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co., New York, 1980.

Ghemawat, M.S., Kapoor, J.N. and Narayan, H.S. A text book of Algae, Ramesh Book Depot, Jaipur, 1976.

Gilbert, M.S. Cryptogamic Botany, Vol. I & II (2nd Ed.), Tata McGraw Hill, Publishing Co. Ltd., New Delhi, 1985.

Kumar, H.D. Introductory Phycology, Affiliated East–West Press, Ltd., New York, 1988.

Pandey, S.N. and Trivedi, P.S. A Text Book of Botany 2000 Volume I, Vikas Pub. House Pvt. Ltd., New Delhi.

Puri, P. Bryophytes, Atmaram & Sons, Delhi, Lucknow, 1985.

Singh, V., Pande, P.C. and Jain, D.K. A Text Book of Botany, Rastogi & Co., Meerut, 2001.

Vashista, B.R. Botany for Degree Students (Algae, Fungi Bryophyta), S. Chand & Co. Ltd., New Delhi, 2002.

PAPER – II
MYCOLOGY, MICROBIOLOGY AND PHYTOPATHOLOGY

Unit 1: General characters, Classification and economic importance of fungi. Important features and life history of Mastigomycotina–*Pythium* and *Albugo*; *Zygomycotina–Rhizopus*; *Ascomycotina–Saccharomyces, Aspergillus* and *Penicillium*.

Unit 2: Important features and life history of Basidiomycotina– *Puccinia, Agaricus* and wild Mushroom and *Ustilago*; Deuteromycotina–*Collectotrichum* and *Alternaria*.

Unit 3: Viruses: Chemical and physical nature; Structure, multiplication and transmission of plant viruses. Tobacco mosaic virus and yellow vein mosaic virus disease. General account of Viroids, AIDS and Prions.

Unit 4: Bacteria–Structure, nutrition, cell division, reproduction and economic importance. Biofilms and Quorum sensing in microbes. Cyanobacteria–Life history of *Nostoc* and *Oscillatoria*; Nitrogen fixation – by BGA (Blue green algae). General account and biology of Mycoplasma and Phytoplasma.

Unit 5: Causes and symptoms of plant diseases with special reference to green ear disease of Bajra, smut of wheat, citrus canker, little leaf of brinjal and root knot disease. A brief account of principles of plant protection.

SUGGESTED LABORATORY EXERCISES

Microscopic preparation and study of following fungal materials: *Albugo, Rhizopus, Saccharomyces, Aspergillus, Penicillium, Ustilago, Agaricus,* local Mushroom¸ *Colletotrichum* and *Alternaria*. Viruses: Study of disease symptoms caused by Tobacco mosaic virus and yellow vein mosaic virus.

Bacteria: Gram staining of bacteria. *Nostoc, Oscillatoria* and study of bacteriological specimens. Study of symptoms of following diseases: (specimen or photographs)

Green ear disease of bajra

Smut of wheat

Citrus canker

Rust of wheat

Little leaf of bringal

Root knot nematode.

SUGGESTED READINGS

Alexopoulos, C.J. and Mims. Introductory Mycology, John Wiley and Sons, New York, 2000.

Bilgrami, K.S. and Dube, H.C. A Text Book of Modern Plant Pathology, Vikas Publ. House, New Delhi, 1976.

Biswas, S.B. and Biswas, A. An Introduction to Viruses, Vikas Publ. House, New Delhi, 2000.

Clifton, A. Introduction to Bacteria, McGraw Hill Co., New York, 1985.

Dube, H.C. Fungi, Rastogi Publication, Meerut, 1989.

Kaushik, P. Microbiology, Emkay Publication, 2001.

Madahar, C.L. Introduction to plant viruses, S. Chand & Co. Ltd., New Delhi, 1978.

Palezer, Chan and King. Microbiology, McGraw Hill Book Co., London, 1995.

Pathak, V.N. Fundamentals of Plant Pathology, Agro Botanica. 2000.

Purohit, S.S. Microbiology, Agro. Bot. Publication, Jodhpur, 2002.

Sharma, O.P. Fungi, Today and tomorrow Publication, 2000.

Sharma, P.D. Microbiology and Plant Pathology, Rastogi Publ. Meerut, 2003.

Singh, V. and Srivastava, V. Introduction to Bacteria, Vikas Publication, 1998.

Vashista, B.R. Botany for Degree student Fungi, S. Chand & Co., New Delhi, 2001.

PAPER – III
PALAEOBOTANY, PTERIDOPHYTES AND GYMNOSPERMS

Unit 1: Geological time scale, Fossilization. General characters and classification and Pteridophytes. Important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida. Stelar systems in Pteridophyta. Structure and reproduction in *Rhynia*.

Unit 2: Occurrence, Structure and life history of *Lycopodium, Selaginella* and *Equisetum*.

Unit 3: Occurrence, structure and life history of *Adiantum, Marsilea* and *Azolla*. Heterospory in Pteridophyta.

Unit 4: Characteristics of seed plants, evolution of the seed habit. General features of gymnosperms and their classification; evolution, diversity and economic importance of Gymnosperms. *Cycas*: Morphology of vegetative and reproductive parts, anatomy of root, stem and leaf; Reproduction and life cycle.

Unit 5: *Pinus* and *Ephedra*: Morphology of vegetative and reproductive parts, anatomy of root, stem and leaf, reproduction and life cycle.

SUGGESTED LABORATORY EXERCISES

Palaeobotany: Microscopic examination of slides of *Rhynia*.

Pteridophytes: Study of external morphology of *Lycopodium, Selaginella, Equisetm, Adiantum, Marsilea,* and *Azolla*. Microscopic study of temporary double stained preparations of stem/rhizome of *Lycopodium, Selaginella, Equisetum* and *Marsilea*.

Study of temporary single stained microscopic preparations of cone of *Selaginella* and T.S. of Sporophyll of *Adiantum* and sections of sporocarp of *Marsilea*.

Gymnosperms:Study of external morphology of plant parts of *Cycas*: young and old foliage leaf, scale leaf, bulbils, male cone, microsporophyll, megasporophyll and mature seed (if material is not available show photographs).

Microscopic temporary double stained preparations of rachis and leaflet of Cycas. Study of T.S. normal and Corolloid root by permanent slides.

Study of external morphology of plant parts of *Pinus* habit, long and dwarf shoot, male cone; female cone; winged seeds.

Microscopic temporary preparation of pollen grains (W.M.) of *Pinus*. Study through permanent slides T.S. stem: young and old; male/female cone of *Pinus*.

Study of habit and structure of whole male and female cone of *Ephedra*.

Microscopic preparation of male and female flowers of *Ephedra*.

SUGGESTED READINGS

Bold, H.C., Alexopolous, C.J. and Delevoryas, T. Morphology of plant and fungi (4th ed.), Harper and Foul, Co., New York, 1980.

Gifford, E.M. and Foster, A.S. Morphology and Evolution of Vascular Plants, W.H. Freeman and Company, New York, 1988.

Pandey, S.N., Mishra, S.P., Trivedi, P.S. A Text Book of Botany Vol. II, Vikas Pub. House Pvt. Ltd., New Delhi 2000.

Raven, P.H. Evert, R.F. and Eichhom, S.C. Biology of plants, (5th ed.), W.H. Reema and Co., Worth Publication, New York, U.S.A., 1999.

Sharma, O.P. Pteridophytes, Today and tomorrow Publication, 2000.

Sporne, K.R. The Morphology of Gymnosperms, B.I. Publ. Pvt., Bombay, Calcutta, Delhi, 1991.

Vashista, P.C. Gymnosperm, S. Chand & Co. Ltd., New Delhi, 2002.

Vashista, P.C. Pteridophyta, S. Chand & Co. Ltd., New Delhi, 2002.

Wilson, N.S. and Rothewall, G.W. Palaeobotany and evolution of Plants, (2nd ed.), Cambridge University Press, U.K., 1993.

Biotechnolgoy 2015

PAPER I
BIOCHEMISTRY AND BIOSTATISTICS

Max Marks: 50

Unit 1: Introduction: General Composition of living matter-A Brief account and function of biomolecules.

Bioenergetics: Principles of bioenergetics. Energy Rich compounds. Biological oxidation-reduction reactions.

Water: Properties of water molecule, Hydrophilic and hydrophobic groups in biological molecules.
Carbohydrates: Classification and general structure and properties of monosaccharides.

Lipids: Classification and general structure, properties of fats and Oils.

Unit 2: Amino Acids: Classification, general structure and properties
Proteins: Classification three–dimensional structure (helicity, bending, pleats, salt-bridges etc) and the basis for intermolecular interactions in enzyme– substrate and antigen-antibody recognition.

Nucleotides: Composition, General structure and properties.
Nucleic Acids: Types and general structure, Non-canonical DNA Structures (Bent DNA, cruciform triple stranded, G quartet, slipped DNA)

Unit 3: Enzymes: Classification, Nature specificity & mechanism of catalysis, kinetics, inhibition, allosteric control.
Enzyme Technology: Enzyme Production, various sources of enzymes, extraction, purification & packaging.
Enzyme Applications: Therapeutic, Manipulative, Industrial and Analytical (ELISA & Biosensors)

Unit 4: Collection, classification, Tabulation and diagrammatic and graphical representation of statistical data: Histogram, pie chart, bar diagram, frequency polygon. Measurement of central tendency: Mean, Median, Mode.

Unit 5: Measurement of dispersion : Mean Deviation, Standard Deviation, Standard Error, Variance, Coefficient of correlation, test for significance : t-test, (Single sample Mean and Two sample Mean), Chi-Square Test and F-Test.

PAPER II
CELL BIOLOGY AND GENETICS

Max Marks: 50

Unit 1: Cell as a basic unit of living systems: The cell theory.Prokaryotic and Eukaryotic Cell, Eukaryotic Cell – Shape Size, Volume, and Number.

Broad classification of cell types: PPLOs, Bacteria, Plant and Animal cells. A detail classification of cell types within an organism.Cell, tissue, organ and organisms as different levels of organization.

Unit 2: Structure and functions of cell organelles; ultra structure of cell membranes, Cytosol, Golgibodies, Endoplasmic reticulum (rough and smooth), Ribosome, Cytoskeletal structure (actins, microtubule etc), Mitochondria, Chloroplasts, Lysosomes, Peroxisomes, and Nucleus (Nuclear membrane, nucleoplasm, nucleolus and chromatin). Cell division, cell cycle and cell growth.

Unit 3: Nature of genetic material, nucleic acids, DNA replication, Mendelian laws of inheritance, gene interaction.
Sex determination in plants and animals. Sex linkage, non-disjunction as a proof of chromosomal theory of inheritance. Linkage mapping of genes, interference, coincidence in Prokaryotes and Eukaryotes.

Unit 4: Chromosome: Chemical composition: Structural organization of chromatids, centromeres, chromatin, telomeres, nucleosomes, euchromatin and heterochromatin. Special types of chromosomes (e.g. polytene and lampbrush chromosomes); Mutations; spontaneous and induced; chemical and physical mutagens;

Unit 5: Basic microbial genetics; conjugation, transduction and transformation. Isolation of auxotrophs, Replica plating techniques, analysis of mutations in biochemical pathways, one-gene-one-enzyme hypothesis. Extra chromosomal inheritance, genetic systems of mitochondria and chloroplast

PAPER III
MICROBIOLOGY AND COMPUTATIONAL BIOLOGY

Max Marks: 50

Unit 1: Development of microscopy (Optical, TEM and SEM). The Concept of sterilization, Methods of sterilization (Dry heat, wet heat, radiation, chemicals and filtration etc.)

Unit 2: Prokaryotic and eukaryotic microbial cells. The various forms of microorganisms-PPLO'S, Cocci,Bacilli and Spirilla. Nature of microbial cell surfaces,gram (+) ve and gram (-) ve bacteria, Types of bacteria on the basis of flagella. Flagellar types in Gram (+) ve and Gram (-) ve bacteria.

Unit 3: Nutritional classification of microorganisms-symbiosis and antibiosis among microbial populations. Microorganisms in extreme environments. Pathogenicity among microorganisms. Defence mechanism against microorganisms and Serotypes.

Unit 4: Microbial metabolism: Spontaneous and induced variation arising in microbial population.Recombination events in bacteria. Nitrogen-fixing microbes in Agriculture. Products from microorganisms-fermentation products, and antibiotics.

Unit 5: Computers: General introduction to Computers, organization of computers, digital and analog computers, computer algorithms.
Computer in online monitoring and automation. Application of computers in co-ordination of solute concentration, pH and temperature etc. of a fermenter in operation.
Introduction to Bioinformatics. Molecular databases, application of data associates tools e.g. BLAST, FASTA, Storage, Retrieval and analysis of sequences. Application of bioinformatics.

PRACTICAL

1. Quantitative estimation of the following in biological samples:
   a. Sugar in given solution
   b. Sugar in biological sample
   c. Extraction and separation of lipids
   d. Estimation of proteins
   e. Estimation of DNA/RNA
   f. Isolation and purification of proteins
   g. Assays for enzyme activity
   h. Kinetic activities on enzymes
   i. Chromatographic methods of separation of macromolecules

2. Demonstration of computers and application.
3. Aseptic techniques:
   a. Preparation of media, cotton plugging and sterilization
   b. Personal hygiene-microbes from hands, teeth and other body parts.
   c. Isolation of microorganism from air, water and soil sample. Dilution and pour plating, colony purification
   d. Enumeration of micro organism from: Total v/s viable counts.
   e. Identification of isolated bacteria. Gram staining, other staining methods, metabolic characteristic.
   f. Growth curve of microorganisms.
   g. Antibiotic sensitivity of microbes- use of antibiotic discs.

SUGGESTED READINGS

Cox, Nelson & Lehninger- Principles of Biochemistry, CBS Publishers & Distributors
L.Stryer- Biochemistry- W.H. Freeman & Co.
Geoffrey Zubay- Biochemistry- Mac-Millan Publishing Co.
J.L. Jain – Biochemistry – S. Chand & Co.
Conn, Stumpf & Blueumming- Outlines of Biochemistry- Wiley Eastern Ltd.
G.M. Malacinski & David Freifelder – Essentials of Molecular Biology- Jonnes & Barlet , Boston
Gardner, Simmons & Snustad- Principles of Genetics, John Wiley & Sons.
P.K. Gupta- a Text book of cell & molecular biology, Rastogi Publication Meerut.
Trevor Palmer- Enzymes- biochemistry, Biotechnology & Clinical Chemistry- Horwood Publishing House.
P D Sharma- Microbiology- Rastogi Publications
Pawar & Daginawala-General Microbiology Vol I & II – Himalaya Publishing House
A J Salle- Fundamental Principles of Bacteriology- Tata McGraw Hill
Pelczar, Chan & Kreib Microbiology – Tata McGraw Hill
Brock & Madigan- Biology of microganisms. Prentice Hall, Inc.
Higgins & Taylor – Bioinformatics, Oxford University Press.
Stephen P Hunt & Rick Liveey- Functional Genomics, Oxford University Press
Rashidi- Bioinformatics basic- Application to life Sciences & Medical Science ASM
B D Singh- Genetics, Kalyani Publishers

PRACTICAL

Time: 5.00 Hrs   Max Mark: 75
                                                            Min Mark: 27

1.	Perform and explain the given biotechnology experiment. Show the result to the examiner	15
2.	Perform and explain the given microbiology experiment.	10
3.	Prepare a bacterial slide by Gram's staining method and report result	06
4.	Identify and comment upon the spots (1 to 6)	24
5.	Viva-Voce	10
6.	Practical Record	10

PAPER - I

CH-101 Inorganic Chemistry

Unit-I

Chemical Bonding-Covalent bond

Valence bond theory and its limitation, Directional characteristics of covalent bond, Hybridizations - sp, sp^2, sp^3, dsp^2, sp^3d, dsp^3, sp^3d^2 and d^2sp^3 with suitable examples. Shapes of inorganic molecules and ions.

  Valence shell election pair repulsion (VSEPR) theory and its application to study the geometry of NH_3, H_2O, H_3O^+, SF_4, ICl_2^-, ClF_3, ICl_4^-, XeF_4, XeF_6 molecules. Molecular orbital theory and molecular orbital diagrams for homo and hetero diatomic molecules-H_2, H_2^+, He_2^+, $H..He^+$, Li_2, Be_2, B_2, C_2, N_2, O_2, F_2, O_2^+, O_2^-, O_2^{2-}, O_2^{2+}, CO and NO.

Bonding in diborane (3c-2e bonding).

Unit-II

Chemical Bonding- Ionic Bond

Born-Haber cycle for e.g. NaCl, $MgCl_2$, Na_2O and MgO. Lattice energy, its calculations using Born-Haber cycle.

Solvation energy, solubility of ionic solids, Fajan's rule, polarizing power and polariziblity of ions.

Structures of ionic solids, radius ratio effect and co-ordination number. Limitations of radius ratio rule.

Hydrogen bonding and vander-waal's forces of attractions.

Unit-III

S-Block elements

Periodicity in properties of alkali and alkaline earth metals. Preparation, thermal stability and solubility's of oxides, nitrates, carbonates, bicarbonates and sulphates of Potassium, Magnesium and Calcium,

Synthesis and applications of important hydrides: NaH, $NaBH_4$, LiH, $LiBH_4$, $LiAlH_4$ and CaH_2.

Cement: Composition and types of Cement, Manufacture of Portland cement.

Lime: Industrial preparation, Properties and Uses.

Unit-IV

P-Block elements

Periodicity in properties of III A, IV A, V A, VI A and VII A group elements.

Silicates, oxides of nitrogen, phosphorous and sulphur- their structure and preparations.
Glass: Types and properties of glasses, coloring agents, Industrial manufacturing of glass.
Nitrogen fixation- Natural and Artificial fixation. Role of nitrogenase in biological nitrogen fixation.

Unit-V

Qualitative Analysis
Theoretical basis of qualitative analysis, Systematic analysis of Acidic and Basic radicals (including interfering radicals). Chemical reactions involved.
 Common- ion effect, solubility product & their applications. Oxidizing and reducing agents and buffers used in analysis.

Books Recommended

Inorganic Chemistry by Satya Prakash
Inorganic Chemistry by R.C. Agarwal
Inorganic Chemistry by B.R. Puri and L.R. Sharma
Inorganic Chemistry by P.L. Soni
Inorganic Chemistry by G.C. Shivhare and V.P. Lavania
Practical Chemistry by Giri, Bajpai and Pandey

PAPER II

CH-102 Organic Chemistry

UNIT: I

Mechanism of Organic Reactions
Classification of organic compounds their general characteristics. Types of reagents – electrophiles and nucleophiles. Types of organic reactions.   Reactive intermediates – carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species. Methods of determination of reactions mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

UNIT: II

Stereochemistry of Organic Compounds
Concept of isomerism. types of isomerism
Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of

enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

Geometric isomerism : Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.
Conformational isomerism :Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.
conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives.

UNIT: III

Alkanes , Cycloalkanes, Alkenes, Dienes and Alkynes
Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity
Cycloalkanes – nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1, 2-and 1, 4-additions, Diels-Alder reaction.

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidic nature of 1-alkynes. Mechamism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, oxidation and polymerization.

UNIT :IV

Arenes and Aromaticity
Nomenclature of benzene derivatives. Aryl group. Aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.
Aromaticity: the Huckel rule, aromatic ions.

Aromatic electrophilic substitution – general pattern of the mechanism, role of α- and π-complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Birch reduction.
Methods of formation and chemical reactions of alkylbenzenes, Structure, preparation and properties of naphthalene.

UNIT : V

Alkyl and Aryl Halides
Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions with energy profile diagrams. Mechanism of elimination reactions of alkyl halides, regioselectivity in dehydrohalogenation, Saytzeff rule.

Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.
.
Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides towards nucleophilic-substitution reactions. Synthesis and uses of DDT and BHC.

Books Recommended

Advanced Organic Chemistry by Mukheri and Kapoor Vol. I & II
A Text Book of Organic Chemistry by M.K. Jain
A Text Book of Organic Chemistry by R.K. Bansal
Organic Chemistry, R.T. Morrison and R.N.Boyd, Prentice-Hall
Organic Chemistry, K.M. Gangotri, R.B.D. Jaipur

PAPER – III

CH-103 Physical Chemistry – I

UNIT I

Mathematical Concepts
Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like a^x, e^x, x^n, sin x, cos x, tan x, log x; maxima and minima, partial differentiation. Integration of some useful functions; like x^n, $1/x$, e^x, constant, sin x, cos x, integration by parts. Permutations and combinations. Probability.

UNIT II

Gaseous States
Deviation from ideal behavior, Van der Waals equation of state and its discussion.
Critical Phenomena: PV isotherms of real gases, continuity of states, relationship between critical constants and Vander Waals constants, the law of corresponding states, reduced equation of state.

Molecular velocities: Root mean square, average and most probable velocities(No derivation). Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect). Numericals.

UNIT III

Liquid State
Intermolecular forces, structure of liquids (a qualitative description).
Structure differences between solids, liquids and gases.
Liquid crystals: Classification,Structure of nematic and cholestric phases. Theory of liquid crystal (Swarm theory).

Colloidal State

Definition of colloids, classification of colloids.
Solids in liquids (sols): properties – kinetic, optical and electrical; stability of colloids, Hardy-Schulze law, protective action, , gold number.
Liquids in liquids (emulsions): types of emulsions, preparation. Emulsifier.
Liquids in solids (gels): classification, preparation and properties, imbibitions. General applications of colloids.

UNIT IV

Solutions
Types of liquid mixtures, ideal and non-ideal mixtures, vapour pressure of liquid mixtures, distillation of completely miscible liquid mixtures.
Partially miscible liquids-phenol-water, triethylamine-water, nicotine-water-systems, consolute temperature-lower and upper, Effect of impurity on consolute temperature-Phenol-water system, Completely miscible liquids, Principal and Methodology of steam distillation. Numericals

UNIT V

Chemical Kinetics
Rate, order, molecularity and stoichiometry of a reaction, Derivation of Integrated rate law and characteristics of zero, first and second order reactions, Pseudo-first order reaction, Determination of the order of reaction-differential method, method of integration(hit and trial method), half-life method and isolation method.

Theories of Reaction Rate: Simple collision theory and its limitations, transition state theory (equilibrium hypothesis) and derivation of the rate constant, Thermodynamical formulation of rate constant, Comparison of collision theory and transition state theory. Numericals

Books Suggested:

1. Physical Chemistry, G.M. barrow, International Student Edition, McGraw Hill.
2. Physical Chemistry, R.A. Alberty, Wiley Eastern Ltd.
3. The Eelements of Physical Chemistry, P.W. Atkins, Oxford.
4. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wile Eastern Ltd.
5. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shobhan Lal Naginchand & Co.
6. Physical Chemistry, Bahl and Tuli, S. Chand & Co.(P) Ltd.
7. Physical Chemistry, Vol. I & II, S. Pahari, New Central Book Agency (P) Ltd
8. Physical Chemistry, K.R. Genwa, R.B.D. Jaipur
9. Physical Chemistry, S. Ameta, P.K. Sharma(B), R.Ameta, A.V. Singh, R. Ameta H.P. Udaipur.

B. Sc. I Year (Practicals)

CH – 104 Laboratory Course I

1. Inorganic Chemistry: [20]
Qualitative analysis of inorganic mixture, containing **5**-radicals. Cation analysis, separation and identification of ions (group 0, I, II, III, IV, V and VI). Interfering radicals mixtures and special combination of acidic radicals (CO_3^{2-} & SO_3^{2-}; NO_3^- & NO_2^-; NO_3^- & Br^-; Cl^-, Br^- & I^-; SO_3^{2-}, S^{2-} & SO_4^{2-})

2. Physical Chemistry: [15]
(a) Viscosity:
(i) To determine the viscosity of the given organic liquid by Ostwald Viscometer and
(ii) determine the composition of a binary solution.
(b) Surface Tension:
(i) To determine the surface tension of a given organic liquid by Stalagmometer and
(ii) determine the composition of a binary solution.

3. Volumetric analysis [20]
Redox Titrations:

(i) To determine the strength of given unknown solution of oxalic acid against standard potassium permanganate solution.

(ii)To determine the strength of given unknown solution of ferrous ammonium sulphate against potassium dichromate using potassium ferricyanide as an indicator.

(iii) To determine the strength of given unknown copper sulphate solution iodometrically using starch as indicator.

 (iv)To determine the strength of given unknown potassium dichromate solution iodometrically using starch as indicator.

Viva-Voce   **[5]**

Sessional/Record   **[15]**

Books Suggested (Laboratory Courses):
1. Practical Chemistry S.Giri, D.N.Bajpai and O.P.Pandey Publ. S. Chand
2. Practical Chemistry, K.M. Gangotri, R.B.D. Jaipur.

Examination & Marking Scheme

	Max. Marks: 75	Min. Pass Marks: 27
Time: 5 hours	Regular Student	Ex Student
Inorganic Mixture	20	20
Volumetric Exercise	20	20
Physical Experiment	15	15
Viva- Voice	5	5
Sessional and Record	15	…
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Total	**75**	**60***

*To be converted out of 75

Inorganic qualitative mixture for 5 radicals: Correct Identification of group- 1 mark each, correct radical reporting- 2 marks each and proper reporting of observations- 1 marks.

Volumetric Exercise: An error up to 1% carries full marks. For each subsequent 0.1% error deduct 1 mark, 8 marks reserved for procedure.

Physical Experiment: Correct Observations- 6 mark, Calculation and Formula-5, Correct Result-4 marks.

B. Sc. I year
Geology   2015

Theory

Paper I	Physical Geology	50 Marks
Paper II	Mineralogy	50 Marks
Paper III	Palaeobiology	50 Marks
Practicals :	Practical Examination	75 Marks

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Total   225 Marks

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Duration of each theory paper Examination   3 Hrs.

Duration of Practical Examination   3 Hrs.

PAPER I   :   PHYSICAL GEOLOGY

Unit I

Geology and its perspectives. Earth in the Solar System: origin, size, shape, mass, density, rotational and revolution parameters. Age of the Earth. Chemical composition of the Earth. Internal structure of the Earth. Formation of hydrosphere, atmosphere and biosphere. Internal heat and Radioactivity of the Earth; Convection in the Earth's core and its magnetic field. Introduction to basic tenets of origin of the Universe, the solar system.

Unit II

Elementary ideas of continental drift, Sea floor spreading and the theory of plate tectonics. Types of plates. Causes and rate of plate movement. Application of theory of plate tectonics in Geology to explain origin of mineral deposits Mountains, Earthquake belts, Island arcs and various Petrogenesis.

Unit III

Rock Weathering and Erosion. Difference between Weathering and Erosion. Types of weathering, Soil formation, soil profile and soil types.

Geological work of rivers, glaciers, wind and groundwater.

Unit IV

Earthquakes: Their causes, effects and distribution. Earthquake waves. Measurement of Earthquakes.

Volcanoes: Types, Products and distribution.

Unit V

Oceanography : Geological work of Ocean; Physical features of Oceans, Coasts, Deep Sea trench, Midoceanic Ridges and Abyssal plain. Generation of oceanic currents, surface currents and global ocean Conveyor system; wave erosion and beach processes; ocean as a thermostat for the earth's surface heat balance.

Climatology : Atmospheric circulation, weather and climate changes. Land-air-sea interaction, Earth's heat budget and global climatic changes. Glacial, interglacial periods and ice ages.

PAPER II: MINERALOGY

Unit I

 Fundamental laws of crystallography, elements of crystal symmetry, Millers, Weiss and Millarian system of notation and parameters. Crystal forms and their classification into crystal system, Introduction to space lattice.

Study of the normal classes of following crystal systems – Cubic system, Tetragonal system, Hexagonal system, Trigonal system, Orthorhombic system, monoclinic system, Triclinic system. Introduction to Symmetry classes (32). Twinning.

Unit II

 Physical properties of minerals. Concept of Isomorphism, Polymorphism, Solid solution, Exsolution. Elementary idea about structure and classification of silicate minerals. Physical properties of the following minerals.

Quartz, jasper, Orthoclase, Plagioclase, Microcline, Muscovite, Biotite, Garnet, Olivine, Augite, Hornblende, tourmaline, Talc, Gypsum, Fluorite, Calcite, Apatite, Barite, Asbestos, Corundum. Phosphorite, Beryl, Kyanite, Galena, Sphalerite, Chalcopyrite, Pyrite, Magnetite, Hematite,Chromite, Pyrolusite and Psilomelane, Bauxite, Coal, Lignite.

Unit III

 Petrological microscope and its construction; principles of optics as applied to orthoscopic and conoscopic study of minerals : color, form, birefringence, pleochroism, uniaxial and biaxial

characters of minerals. Study of optical properties of Muscovite, Biotite, Quartz, Orthoclase, Microcline, Plagioclase, Olivine, Augite and Hornblende.

Unit IV

Mineralogical study of the following families.

    (i)   Olivine   (ii) Pyroxene   (iii) Amphibole

Unit V

Mineralogical study of the following families.

    (i)   Quartz   (ii) Feldspar   (iii) Mica   (iv) Garnet

PAPER III: PALAEOBIOLOGY

Unit I

Fossils, their preservation and uses. Elementary idea of organic evolution. Morphology of hard parts and geological distribution of foraminifera. Introduction to Nummulites.

Unit II

Study of morphology and geological distribution of Graptoloidea, Echinoidea and Corals. Introduction to Monograptus, Diplograptus, Cidaris, Hemiaster, Micraster, Calceola and Zaphrentis.

Unit III

Study of morphology of hard parts and geological distribution of Gastropoda, Lamellibranchia and Trilobita. Introduction toTrochus, Murex, Physa, Turritella, Natica, Conus, Cyprea, Calymene, Paradoxides, Trinucleus Phacops, Lima, Pecten, Ostrea, Gphea, Exogyra, Mytilus, Trigonia and Hippurites.

Unit IV

Study of morphology and geological distribution of Brachiopoda and Cephalopoda. Introduction to Productus, Spirifer, Terebratulla, Rhynchonella. Nautilus, Beleminites, Phylloceras, Orthoceras, Goniatites, Ceratites and Perisphinctes.

Unit V

Elementary knowledge of Gondwana flora and vertebrates of Siwaliks. Evolutionary history of Man, Horse and Elephant. Introduction to Glosopteris, Gangmopteris, Vertibraria and Ptilophyllum.

PRACTICALS

(1)   Identification and Description of fossils in hand specimens.

(2)   Identification and Physical Properties of Minerals in hand specimens.

(3)   Identification and Description of Minerals under Petrological microscope

(4)   Physical Geology Experiments.

(5)   Sessional Marks.

SUGGESTED READING

1. Dutta A. K. 'Physical Geology.'

2. Gosh Mukul   'Bhautic Bhu Vigyan.' Madhya Pradesh Hindi Granth Academy., Bhopal.

3. Aurther Homes.   'Principles of Physical Geology'

4. Savinder Singh   'Bhu Akrati Vigyan'

5. Read H.H   'Rutley's Elements of Mineralogy. 26th Ed CBS Pub. New Delhi

6. Jain BC 'Khaniz tatha Crystal Vigyan,. Madhya Pradesh Hindi Granth Academy., Bhopal.

7. Tiwari D. R. 'Khaniz Vigyan'. Madhya Pradesh Hindi Granth Academy., Bhopal.

8. Deer WA, Howie RA and Zussman J. 1996: ' The Rock forming minerals' Longman publishers.

9. Woods, H., 1985: 'Invertebrate Palaeontology' CBS Publishers and Distributions. New Delhi.

10. Mishra R P 'Jeevashm Vigyan'. Madhya Pradesh Hindi Granth Academy., Bhopal.

11. Moore R. C., Lalicher CG and Fisher AC : 'Invertebrate fossils'. Mc Graw Hill.

B. SC. I Year

Physics 2015

Paper I: MECHANICS

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT-1. :

Frames of Reference: Inertial frames, Galilean transformations, Non-inertial frames, fictitious forces, Displacement, Velocity and acceleration in rotating coordinate systems and their transformations, Coriolis force, Focault's pendulum, Motion relative to earth.

Centre of Mass, collision of particles in laboratory and C.M. frames.

Trajectory of a particle under inverse central force.

Motion of a system with varying Mass.

UNIT-2:

Special Theory of Relativity: Invariance of c. Michelson-Morley Experiment, Lorentz transformations, Addition of velocities, Time dilation and length contraction.

Conservation of momentum in collision at relativistic speeds and variation of mass with velocity, relativistic energy, mass-energy equivalence, work and energy, transformation equations for momentum, energy and rate of change of momentum.

UNIT-3:

Oscillations : Qualitative idea of oscillations in an arbitrary potential well, General differential equation for the harmonic motion, Helmholtz resonator,

mass on a spring, oscillation of two masses connected by a spring, reduced mass.

Coupled oscillations, normal modes, normal coordinates of two linear coupled oscillators, damped harmonic motion, example of a galvanometer with small damping.

Forced oscillations and resonances, Resonance width and quality factor, LCR circuits and phase relations.

UNIT-4 :

Waves : General differential equation of one dimensional wave motion and its solution. Plane progressive harmonic wave, Differential calculus methods for speed of transverse waves on a uniform string and for that of longitudinal waves in a fluid, energy density and energy transmission in waves.

Superposition of waves, group and phase velocity, non-linear superposition and consequences.

Acoustics : The human ear, musical scale, acoustic impedance of a medium, principle of a sonar system.

Fourier series, Fourier analysis of square and saw-tooth waves.

UNIT-5 :

Rigid Body Dynamics : Equation of motion of a rotating body, Inertial coefficient, case of $\vec{j}$ not parallel to $\vec{w}$, kinetic energy of rotation and idea of principal axes, Precessional motion of spinning top.

Elasticity : Young modulus, Bulk modulus and modulus of rigidity, Poisson ratio, relation between elastic constants, Theory of bending of a beam and torsion of a cylinder, experimental determination of Y by loading a beam in the middle and of η by static and dynamic methods, Searle's two bar experiment.

Books recommended :

1. Berkeley : Physics Course, Vol. I, Mechanics, Tata McGraw Hill, New Delhi.
2. Berkeley : Physics Course, Vol. III, Waves and Oscillations, McGraw Hill, New Delhi.
3. A. P. French : Physics of Vibration and Waves.
4. Alonso and Finn : Fundamental University Physics, Vol. I, Mechanics.
5. R. S. Gambhir : Mechanics, CBS Publishers.
6. J.C. Upadhyaya : Mechanics, Ram Prasad & Sons, Agra.

PAPER II : OPTICS

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT-1 :

Geometrical Optics : Axial, Lateral and angular magnifications and their inter-relationship; Abbe's Sine condition for spherical surfaces; Aplanatic points for a spherical refracting surface, Abbe's oil immersion objective.

Focal length of two thin lenses separated by a distance, Cardinal points of a co-axial lens system, properties of cardinal points; construction of image using cardinal points; Newton's formula and other relations for a lens system using cardinal points, Ramsden's and Huygen's eye pieces, their cardinal points, and relative merits.

Spherical aberration in lenses and methods to minimize it.

Chromatic aberration in lenses; Achromatism for two thin lenses in contact and separated by a distance.

UNIT-2 :

Interference : Temporal and spatial coherence, coherence length, effect of size of slit and purity of a spectral line.

Division of Amplitude-Interference exhibited by thin film, Production of colours in thin films, Wedge-shaped film. Newton's rings and determination of wavelength and refractive index of a liquid by Newton's rings.

Michelson Interferometer : Measurement of wavelength, difference between two close wavelengths and thickness of a thin plate.

Fabry-Perot interferometer, Intensity Distribution, Co-efficient of sharpness and half width, measurement of wavelength and resolution of spectral lines of a close doublet.

UNIT-3 :

Lasers and Holography : Spontaneous and stimulated emission, Einstein's A & B coefficients, population inversion, laser as source of coherent radiation, Basic principles of He-Ne Laser, Basic concepts, concepts of holography.

Diffraction : Fresnel's class of diffractions, Cornu's spiral (non-mathematical) Zone Plate; Phase reversal Plate; Cylindrical wave front and its effect at an external point and geometrical construction, diffraction at a straight edge; thin wire; rectangular slit and circular aperture.

UNIT-4 :

Fraunhofer class of diffraction: Amplitude and phase due to a number of SH Motions acting on a particle simultaneously, Diffraction at two slits and intensity distribution, Diffraction at N slits.

Plane Transmission Grating: Theory and formation of spectra, width of principal maxima; absent spectra, overlapping of spectral lines; number of spectra; measurement of wave-length of light; Dispersive Concave Reflection grating; Rowland Mounting; Resolving Power of an instrument, Rayleigh's criterion, Resolving Power of a Prism, Telescope, Microscope and plane transmission grating.

UNIT-5 :

Polarization: Double refraction, production of plane polarized light by double refraction, Nicol Prism, Double refraction in uniaxial crystals, Huygen's explanation of Double Refraction, Plane, circular and elliptically polarized light, Half-wave and quarter-wave plates; production and detection of plane, circularly and elliptically polarized light by Nicol Prism and Quarter-wave plate.

Rotatory Polarization, Fresnel's explanation, specific rotation, half shade and Biquartz Polarimeter, determination of specific rotation and strength of sugar solution.

Books suggested :

1. Jenkins & White : Optics, McGraw Hill.
2. Ghatak A.K. : Optics, Tata McGraw Hill.
3. Khandelwal D.P. : Optics and Atomic Physics, Shivlal Agarwal & Co.
4. Subramanayam & Brijlal : A text book of optics, S.Chand New Delhi.

PAPER III: ELECTROMAGNETICS

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT-1 :

Vector Fields: Scalar and Vector fields, gradient of a scalar field, divergence of vector field and their physical significance, curl of vector field, line integral of vector field, surface integral and flux of a vector field. Gauss law, its integral and differential form, statement and explanation of Gauss theorem and Stokes theorem.

UNIT-2 :

Electrostatics : Potential and field of an arbitrary charge distribution, concept of multi-poles, Potential & field due to a dipole and quadrupole, torque on a dipole in an electric field. Electrostatic energy of a uniformly charged sphere. Classical radius of an electron.

Electric field in matter : Atomic and molecular dipoles, polarizability, permanent dipole moment, Dielectrics, polarization Vector, capacity of parallel plate condenser with partially or completely filled dielectrics, electric displacement and Gauss Law in general form, electrostatic energy of a charge distribution in dielectrics. Lorentz local field and Clausius-Mossotti equation.

UNIT-3 :

Electrostatic fields: Conductors in an electric field, boundary condition for potential, boundary conditions for electrostatic field at electric surface, uniqueness theorem, method of images and its application for system of point charge near a grounded conducting plane. Poisson's and Laplace equation in Cartesian, cylindrical and spherical polar coordinates (without derivation).

Solution of Laplace equation in Cartesian coordinates, potential at a point inside a rectangular box.

UNIT-4 :

Magnetics: Biot-Savart law, Ampere circuital law in integral and differential forms, divergence of B field, Force on a current carrying wire and torque on a current carrying loop in magnetic field.

Magnetic field in matter: Magnetization Vector, uniform magnetization and surface current, non-uniform magnetization, B,M,H Vectors and their inter-relations, Bohr magneton, orbital magnetic moment and angular momentum, Electron Spin and Magnetic moment, Magnetic Susceptibility.

UNIT-5 :

Electromagnetic Induction, Faraday's laws of Electromagnetic induction, its integral and differential form; Lenz's law; Self and mutual inductance, measurement of self inductance by Rayleigh method; Energy stored in magnetic field.

Transient response: Charge and discharge of condenser through resistance, determination of high resistance by leakage, growth and decay of current in LR circuit; A. C. Circuits, use of j operator in alternating current circuits. LCR circuit in series and in parallel (A.C.), phase diagram, Resonance and Q factor, Sharpness of resonance.

Books suggested:

1. Berkeley : Physics Course, Vol. II : Electricity and Magnetism, Tata McGraw Hill.

2. Spiegel, M.R. : Vector Analysis, Schaum's Outline Series, McGraw Hill.

3. Laud, B.B. : Electro-magnetics, Wiley Eastern.

4. Matveev, A.N. : Electricity and Magnetism, Mir Publishers, Moscow.

5. Griffiths : Introduction to Electrodynamics, PHI.

EXPERIMENTS FOR PRACTICAL WORK

Note : Any 16 experiments to be performed by all the students out of following list.

1. Study of bending of a beam and determination of Young's modulus.

2. Modulus of rigidity by statical and dynamical method.

3. Elastic constants by Searle's method.

4. Nodal slide, determination of cardinal points of a combination of two lenses.

5. Formation of spectrum, prism spectrometer and determination of dispersive power of the material of a prism.

6. Wavelength of light by Newton's rings.

7. Wavelength of light by plane transmission grating.

8. Wavelength of light by biprism.

9. Specific rotation by polarimeter.

10. Resolving power of telescope.

11. To determine the Poisson's ratio of a rubber tube.

12. Study of temperature variation of surface tension by Jagger's method.

13. Resolving power of a plane transmission grating.

14. To determine the polarizing angle for the glass prism surface and to determine the refractive index of material of prism using Brewster's law.

15. Low resistance by Carey Foster Bridge.

16. Variation of magnetic field along the axis of circular Coil.

17. Study of an RL Circuit for Phase relations.

18. Study of rise and decay in CR Circuit.

19. Study of electro-magnetic function and verification of Faraday's Laws.

20. To study the excitation of normal modes and measure frequency splitting using two coupled oscillator.

21. To study the viscous fluid damping of a compound pendulum and to determine the damping coefficient and Q of the Oscillator.

PAPER I
CIRCUIT ELEMENTS AND NETWORKS

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1:
Circuit elements: Types of resistors and their rating, inductance, types of inductors, mutual – inductance, transformer principle, types of transformers, capacitance, types of capacitors, LR, RC and RLC circuits, phasor diagrams, series and parallel resonance circuits, Quality factor.

UNIT 2 :
Networks analysis I : Kirchhoff's Laws, superposition theorem, Thevenin's theorem, voltage source equivalent circuit, Norton's theorem, current source equivalent circuit, maximum power transfer theorem.

Unit 3:
Network analysis II : Network definitions, mesh and node circuit analysis, reduction of a complicated circuit into T and π equivalents, conversion between T and π configurations.

UNIT 4 :
Coupled circuits : Coupled circuits and impedance transformation, inductive coupled circuits, equivalent circuits for transformer, tuned coupled circuits, two terminal pair networks, ladder network and characteristics impedance.

UNIT 5 :

Filters: Characteristics impedance of symmetrical T and π networks, constant – k type low, high, band pass and band elimination filters, cascading of filters, attenuators.

PAPERS II
SEMICONDUCTOR DEVICES

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1 :
Semiconductors: Energy bands in metals, insulators and semiconductors , intrinsic semiconductors, mobility and conductivity, extrinsic semiconductors - n type and p type, carrier concentration, conductivity, Fermi levels, Hall effect, generation and recombination of carriers, life time, photoconductivity, diffusion, continuity equation.

UNIT 2 :
Semiconductor diodes :Space charge region and potential barrier, Current - voltage equation, forward and reverse bias characteristics, d.c. and a.c resistance, Space Charge and diffusion capacitances, varactor diode, Zener diode, tunnel diode and their characteristics, metal-semiconductor contact

UNIT 3 :
Transistor characteristics: Bipolar junction transistors, NPN and PNP transistors and their characteristics in CB, CE and CC configurations, α, β and hybrid parameters, simple CE amplifier and its graphical analysis, fabrication of IC components.

UNIT 4:
Field effect transistors: Junction field effect transistors (JFET) and MOSFET and their characteristics, comparison between p channel and n channel MOSFET, Comparison between

BJT and FETs, Silicon controlled rectifier (SCR), Diac, Triac and UJT and their characteristics.

UNIT 5:
Optoelectronics devices : Photoconductivity cells, PN photodiodes, PIN photodiodes, Avalanche photodiode, simple applications of photodiodes, optocoupler, photovoltaic effect, solar cell, LED and Phototransistors, basic concept of laser, semiconductor lasers and LCD.

PAPERS III
THERMIONIC DEVICES AND MEASURING INSTRUMENTS

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1 :
Thermionic emissions : types of cathode materials, vacuum diode and its characteristics, space charge, triode and its characteristics and parameters, tetrode, pentode and their characteristics, V-R tubes and thyratron.

UNIT 2 :
Cathode ray oscilloscope : Construction of CRT, deflection sensitivity of tube, block diagram of CRO, various controls and their operation, details of X and Y sections, horizontal sweep section, synchronization of sweep, triggered sweep, measurement of voltage, current, frequency and phase angle using CRO, basic idea about dual trace CRO.

UNIT 3 :
Power supplies : Half wave and full wave rectification, voltage regulation. Ripple factor, use of inductor, capacitor, L and π type filters, voltage regulation circuit using zener diode

UNIT 4 :

Measuring instruments I : D' Arsonval galvanometer, galvanometer sensitivity, D.C. ammeter, voltmeter, voltmeter sensitivity, d.c. multimeter rectifier type instruments, electrodynamometer, wattmeter, transducers, variable resistance, piezoelectric and pyroelectric transducers

UNIT 5 :

Measuring instruments II : A.C. bridge, balance conditions, Comparison bridges, Maxwell bridge, Hay bridge, Schering bridge, Wien bridge, impedance bridges, Q- meter

Books Suggested :

Millman & Halkias : Integrated Electronics (TMH)
Grob : Basic Electronics Mcgraw Hill 1985
Mottershead : Electronics, Devices and Circuits PHI, 1984
Ryder : Networks, Lines and Fields PHI 1983
Helfrick & Cooper : Modern Electronic Instrumentation & Measurement Techniques, PHI.

EXPERIMENTS FOR PRACTICAL WORK

1.   Design and study of constant voltage source
2.   Design and study of constant current source
3.   Construction of DC Multimeter
4.   Construction of AC Multimeter
5.   Measurement of impedance by impedance bridge
6.   Frequency response of series resonance circuits
7.   Frequency response of parallel resonance circuits
8.   Semiconductor Diode Characteristics
9.   Zener Diode Characteristics
10.   Transistor characteristics in CB mode
11.   Transistor characteristics in CE mode
12.   FET Characteristics
13.   Single Stage BJT amplifier
14.   Photocell characteristics
15.   Maximum power transfer from source to load using reactive circuit
16.   Single Stage Troide amplifier
17.   UJT Characteristics
18.   Voltage regulation by Zener Diode
19.   Phase diagram and phase angles of RC circuits using CRO.
20.   Characteristics of Thyratron
21.   Characteristics of triode
22.   Single stage FET amplifier.
23.   DIAC characteristics.

B. Sc. I Year
Computer Science 2015

PAPER – 1

COMPUTER ORIENTED NUMERICAL METHODS AND FORTRAN

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1:

Language FORTRAN: Numerical constants, Variable names, Type statements, Arithmetic operations, Arithmetic expressions, Mixed Mode, Built in mathematical functions, unformatted input out-put, Formatted input out-put, Field specifications, output field specifications, literal field, records, Repetition factors.

UNIT 2:
Transfer of control: Unconditional and conditional transfer, relational expressions, Logical IF statement & computed GOTO statement, Do Loops : Use of Do Statements , Exit from Do loop, Continue statement, and Nested Do loops, Arrays : Declaration of arrays, Linear and multidimensional arrays, Input /Output Statement for arrays and Implied Do loops.

UNIT 3 :
Function and Subroutine : Subprogram declaration and calling a function subprogram, Arithmetic statement functions, subroutines, difference between function and subroutine,

Logical constants and Logical variables, Logical operators and Logical expressions, Type statement, IMPLICIT Statements, Double precision, Unlabelled Common Statement, Labeled Common Statement, Equivalence Statements.

UNIT 4:
Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalized floating point numbers and their consequences, Errors in number representations.
Iterative Methods for solving Equations: Successive approximation, Bisection, false position and Newton Raphson methods; Convergence of iterative methods.

UNIT 5:
Solution of simultaneous and ordinary differential equations: Taylor's series and Euler's method, Runge-Kutta methods and predictor –corrector method. Newton's and Lagrange's interpolation formula. Numerical differentiation, Numerical Integration: Newton cote's quadrature formula, Trapezoidal rule and Simpson's rule, Curve fitting by the method of least squares.

PAPER II

DATA BASE MANAGEMENT SYSTEM

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1:
Data: Definition, uses, need, purpose of data base system, data abstraction, data models, data independence, data definition language, data manipulation language, data base manager, data base administrator, data base users, over all system structure, implementation and trade-offs of files.

UNIT 2:

Entity-Relationship Model: Entities and entities sets, relationships and relationship sets, attributes, mapping constraints, keys, E-R diagrams, reducing E-R diagrams to tables, generation, aggregation design of an E-R data base scheme.

UNIT 3:
Structure of relational databases, relational algebra, the tuple relational calculus, the domain relational calculus, modifying the database, relational commercial languages: SQL, Query-by-example.

UNIT 4:
RDBMS: Database file creation, updating, indexes, constants and functions and operators, logical functions, relational operators, logical operators, FOR and WHILE clauses.

UNIT 5 :
Report generation, design of report form, page layout, grouping, use of RQBE, understanding relational data bases, one to many relations, many to many and one to one relations, the RQBE window, the Select command.

PAPER III
DIGITAL ELECTRONICS AND COMPUTER ORGANISATION

Note: The question paper for the examination will be divided in three parts i.e., Section – A, Section – B and Section – C.

Section – A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited upto 30 words. Each question will carry 1 mark.

Section – B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited upto 250 words. Each question carry 3.5 marks.

Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and students will answer any 03 questions and answer of each question shall be limited upto 500 words. Each question will carry 7.5 marks.

UNIT 1:
Logic fundamentals and Boolean algebra: Binary, Octal, Decimal and Hexadecimal numbers and their inter conversion, BCD, ASCII and Gray codes, logic gates: DTL and TTL circuits. Boolean algebra, De Morgan's theorems and their applications to logic circuit analysis and synthesis, formulation of minimization problem prime implicants, Karnaugh map.

UNIT 2:
Arithmetic and logic elements: logical construction and analysis of half adder, full adder, adder-subtractor, multiplexers, demultiplexer, Flip Flops: RS latches; level clocking, D-latches, edge triggered D-Flip Flop, JK Flip Flop, JK master slave Flip Flop,

UNIT 3:
Registers and Counters: Buffer register, Shift register: Shift-Left, Shift-Right and ring counter, Counters: Asynchronous & synchronous counter, Mod counters, Divide by N counters, sequential counters and BCD counters.

UNIT 4:
Data Representation: Sign magnitude representation, Fixed-point representation, Floating point representation. Comparison and subtraction of unsigned binary numbers: 4-bit magnitude comparator using logic gates, 4-bit adder-subtractor. Error detection and correction: Parity generator-checker, Hamming codes (1-bit detection-correction).

UNIT 5:
IC Fabrication: Basic monolithic IC, epitaxial growth, photo masking, etching, diffusion of impurities, isolation techniques. Fabrication of: resistance, capacitance, diodes, transistors and FET devices. Advantages of IC technology.

Books Suggested:
Lipschutz, S And Poe, A.: Programming With FORTRAN, Schaum's Outline Series, Mcgraw Hill
Rajaraman, V. : Computer Oriented Numerical Methods, Prentice Hall Of India.
Rajaraman, V. : Computer Programming In FORTRAN, Prentice Hall Of India.
Malvino : Digital Computer Electronics – Introduction To Micro-Computers, Tata Mcgraw Hill.
Malvino : Digital Principles and Application, Tata Mcgraw Hill.
Mottershed : Electronic Devices and Circuits, PHI
Korth, H.P. and Silberschatz, A: Data Base System Concepts, McGraw Hill
Martin, J.: An Introduction to Database System, Vol. I, Narosa Publishing House.
Ulman, J.D.: Principles of Database Management System, (Second Edition), Galgotia Publishers Pvt. Ltd.
Sze S.M. Physics of Semiconductor Devices: Physics & Technology. Wiley Eastern.

EXPERIMENTS FOR PRACTICAL WORK

DIGITAL ELECTRONICS

1. To study the function of Basic Logic Gates and verify their truth table. AND, OR, NOT, NAND, NOR, X-OR.

2.To study the application of AND, OR, NAND, X-OR gates for gating digital signals.

3. (a) To study the different Logical Expression and their simplifications.

   (b) To familiarize and verify the Boolean algebraic theorems.

4.To study the different arithmetic circuits using logic gates:
   (a) Half adder and Half subtractor.
   (b)Full adder.
5.To study the BCD to Binary and Binary to BCD code converter.
6.To study the Binary to Gray and Gray to Binary code converter.
7.Study of Encoder circuits:
   (a) Decimal to BCD encoder.
   (b)Octal to Binary encoder.
8. Study of Decoder circuits:
   (a)BCD to Decimal decoder.
   (b)BCD to 7 segments decoder.
9.To study the Flip-Flop circuits using gates:
    (a) R-S Flip-Flop.
    (b) J-K Flip-Flop.
    (c) Master slave J-K Flip-Flop.
    (d) D Flip-Flop.
10. To study the R-S, J-K and D Flip-Flop ICs.
11. Study the Registers and Counters:
     (a) Study of Shift Registers.
     (b) Study of Ring Counter.
12. To study the Asynchronous counter using Flip-Flop ICs
13. To study the Asynchronous counter ICs
14. To study the Synchronous counter using Flip-Flops ICs
15. To study the Synchronous counter ICs

SOFTWARE LABORATORY

1. To write the program to show use of arithmetic operations with different data types.
2. To write the program to show use of Input and Output statements.
3. To write the program to show use of arithmetic expression using build-in functions.
3. To write the program using arithmetic IF statement.
4. To write the program using logical IF statement.
5. To write the program using DO loops.
7. To write the program using Arrays.

8. To write the program using function sub program.

9. To write the program using subroutine sub program.

10. To write the program using COMMON Statements.

11. Write a program to find solution of quadratic equation.

12Write a program to find root of an equation by Bisection method.

13. Write a program to find root of an equation by Secant method.

14. Write a program to find transpose of matrix.

15. Write a program to solve the set of simultaneous equations by Gauss elimination method.

16. Write a program to evaluate a polynomial by nested multiplication method.

17. Write a program to solve the set of simultaneous equations by Gauss-Seidal elimination

method.

18. Solution of a differential equation by Euler's method.

19. Solution of a differential equation by Predictor-Corrector's method.

20. Numerical integration using Trapezoidal Rule.

B.Sc. I Year
Mathematics 2015

Paper   I   : Algebra and Co-ordinate Geometry of Two Dimensions.

Paper   II :   Calculus
Paper   III: Co-ordinate Geometry of three Dimensions and Vector Calculus.

Note: **Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C**

Section A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 2 marks.
Section B: Will consist of 10 questions. Each unit will be having two question; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 5 marks.
Section – C: Will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 10 marks.

Total Marks: 75

Paper I
Algebra and Co-ordinate Geometry of Two Dimensions

Unit1: The characteristic equation of a matrix, eigen values and eigen vectors, Cayley-Hamilton theorem and its use in finding the inverse of a matrix. Inequalities, Continued fractions.

Unit 2: Relations between the roots and coefficients of general polynomial equation in one variable, symmetric functions of roots, transformation of equations. Descarte's rule of signs, solution of cubic equations (Cardon method), biquadratic equations.

Unit 3: Infinite series. Convergent series, tests for convergence of a series, comparison test, D'Alembert's Ratio test, Cauchy's root test, Raabe's test, De Morgen and

Bertrand's test, Cauchy's condensation test, Gauss's test. Alternating series, Leibnit'z test (Derivation of above tests not required).

Unit 4 : Polar equation of a conic, polar equations of tangent, normal, asymptotes, chord of contact, auxiliary circle, director circle of a conic and related problems.

Unit 5 : General equation of second degree. Tracing of conics.

SUGGESTED BOOKS

M. Ray : A Text Book of Higher Algebra, S.Chand & Co., New Delhi

Bansal, Bhargva, Agarwal : Algebra (Hindi Ed.), Jaipur Publishing House, Jaipur.

Bansal, Bhargava : 2-D Coordinate Geometry (HindiEd) Jaipur Publishing House, Jaipur.

Sharma, Varshney : Coordinate Geometry, Pragati Prakashan, Meerut.

Gokhroo, Saini, Ojha : 2-D Geometry (Hindi Ed.), Navkar Publication, Ajmer.

Paper – II Calculus

Unit 1: Polar Co-ordinates. Angle between radius vector and the tangent. Angle between curves in polar form. Length of polar subtangent and polar subnormal, Pedal equation of a curve, Derivatives of an arc, curvature, various formulae, Centre of curvature and chord of curvature and related problems.

Unit2:Partial differentiation, Euler's theorem on homogeneous functions, chain rule of partial differentiation, Maxima and Minima of functions of two independent variables and of three variables connected by a relation Lagrange's Method of undetermined multipliers.

Unit 3: Asymptotes, double points, curve tracing, Envelopes and evolutes.

Unit 4: Rectification. Volume and Surface of solids of revolution. Theory of Beta and Gamma functions; Differentiation and integration under the sign of integration.

Unit 5: Evaluation of double and triple integrals and their applications in finding area and volume. Dirichlet's integral. Change of order of integration and changing into polar co-ordinates.

SUGGESTED BOOKS

Gorakh Prasad: A Text Book of Differential Calculus; Pothishala Pvt.Ltd.Allahabad

Bansal, Bhargava and Agarwal : A Text Book of Differential Calculus II (Hindi Ed.) and Integral Calculus, Vol. II (Hindi Ed.); Jaipur Publishing House, Jaipur

Gokharoo, Saini : Differential Calculus (Hindi Ed.); Navkar Prakashan, Ajmer.

Tandon, O.P. and Sharma, K.C. : Integral Calculus; Jaipur Publishing House, Jaipur

Gupta, Juneja and Tandon : Differential Calculus (English Ed.);Ramesh Book Depot,

Jaipur.

Gorakh Prasad : Integral Calculus; Pothishala Pvt.Ltd.Allahabad

Paper – III

                Co-ordinate Geometry of 3-Dimensions and Vector Calculus.
Unit 1 : Sphere, Cone and Cylinder (Rectangular Coordinates only)

Unit 2 : The Central Conicoids (referred to principal axes). Tangents and tangent planes, Polar planes and polar lines, Section with a given centre, Enveloping cone, Enveloping cylinder and related problems.

Unit 3 : Equations of the normal to an ellipsoid, number of normals from a given point to an ellipsoid, Cone through six normals, Conjugate diameter and diametral planes and their properties. Cone as a Central surface. Paraboloids.

Unit 4 : Plane Sections of Conicoids, Umbilics, Generating lines of hyperboloid of one sheet and its properties.

Unit 5 : Vector Calculus : Curl, Gradient and Divergence and Identities involving these operators. Theorems of Stoke's, Green and Gauss (Statement, application and verification only).

SUGGESTED BOOKS

Gupta, Juneja : Vector Analysis; Ramesh Book Depot, Jaipur.

Gokhroo, Saini, Bhati : Vector Calculus (Hindi Ed.); Navkar Prakashan, Ajmer

Bhargava, Banwari Lall : Vector Calculus (Hindi Ed.); Jaipur Publishing House, Jaipur

Bell, R.J.T.: Coordinate Geometry of Three dimensions;Macmillan India Ltd., New Delhi

Vasistha, Agarwal : Analytical Solid Geometry; Pragati Prakashn, Meerut

Gokhroo, Saini & Rathi : Analytical 3-D Geometry (HindiEd);Jaipur Pub. House, Jaipur

Bansal, Bhargva, Agarwal : 3-D Coordinate Geometry II; Jaipur Pub. House, Jaipur

Statistics 2015

Paper   I : Statistical Methods

Paper   II : Elements of Probability
Paper   III: Applied Statistics
Practical

Note: **Each theory paper is divided in three parts i.e. Section – A, Section – B and Section – C.**

Section A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry 1 mark.
Section B: Will consist of 10 questions. Two questions from each unit will be set and students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question will carry 3.5 marks.
Section – C: Will consist of total 05 questions. The paper setter will set one question from each Unit and Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question will carry 7.5 marks.
Total Marks: 50

Paper I
     Statistical Methods

Unit 1: **Definition, Importance, Scope, Limitations, distrust and functions of statistics,**

Planning of a statistical enquiry, sources of data, classification and tabulation of statistical

data.

Unit 2: **Diagrammatic and graphical representation of statistical data, graphs of frequency**

distribution, histogram, frequency polygon and ogives.

Unit 3: **Measures of central tendency: Mean, Median and Mode, requisites of an ideal average, their merits and demerits, dispersion and its various measures.**

Unit 4: **Moments, raw moments, central moments and interrelationship between them, skewness and its various measures. Kurtosis and its measures.**

Unit 5: **Theory of attributes, class frequency, their order, consistency of data, incomplete data, association and independence of attributes, coefficient of association.**

SUGGESTED BOOKS

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Delhi.

Gupta, S.P.: Statistical Methods, Sultan Chand & Sons, Delhi.

Paper II

Elements of Probability

Unit 1: **Random experiment. Sample space, events. Union and interaction of events, mutually exclusive, exhaustive, independent and equally likely events. Classical and Statistical definitions of probability and simple problems. Axiomatic approach to probability. Addition law of probability for two or more events.**

Unit 2: **Conditional probability. Multiplication law of probability, Statistical independence of events. Bayes theorem and its simple applications.**

Unit 3: **Random Variable: Discrete and continuous random variables. Probability mass and density functions, joint, marginal and conditional probability function. Distribution functions.**

Unit 4: **Mathematical Expectation: Definition of expectation, Addition and Multiplication laws of expectation. Moments and product moments in terms of expectation, variance and covariance for the linear combination of random variables Elementary idea of conditional expectation. Schwartz's inequality.**

Unit 5: **Moments generating and Cumulant generating functions with properties. Joint Moment generating function. Characteristic function with properties (without proof).**

SUGGESTED BOOKS

Gupta, S.C. and Kapoor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Delhi.

Kapoor, J.N. and Saxena, H.C.: Mathematical Statistics, S.Chand & Co., Delhi

Goon, A.M., Gupta M.K., Dass Gupta.: Fundamentals of Statistics, Vol. 1, World Press, Calcutta, 1991.

Gokharoo, D.C. and Saini, S.R.: Mathematical Statistics (Hindi ed.), Navkar Prakashan, Ajmer.

Bhargava, S.L. and Agarwal, S.M., Mathematical Statistics (Hindi) ed.), Jaipur Publishing House, Jaipur.

David, R.: Elementary Probability, Oxford Press

Bhat, B.R., Srivenkatramana, T. and Rao, Madhava K.S. (1977): A Beginner's Text, Vol, II, New Age International (P) Ltd., 1996.

Applied Statistics

Unit 1: **Statistical Organizations in India: C.S.O., N.S.S.O., their functions and publications, agricultural Statistics, area and yield statistics, trade statistics.**

Unit 2: **Index Number: Various types of index numbers, construction of index number of prices, fixed base and chain base methods, uses and limitations of these methods.**

Unit 3: **Essential requisites of an ideal index number, cost of living index number and its construction, the notions of splicing, base shifting and deflating.**

Unit 4: **Population Statistics, its nature, vital statistics, measures of mortality and fertility.**

Unit 5: **The growth of population and its measurements, life table, its construction and uses. Indian census, its organization and features.**

SUGGESTED BOOKS

Gupta, S.C. and Kapoor, V.K.: Fundamentals of Applied Statistics

Goon, A.M. and others: Fundamentals of Statistics, Vol. II, World Press, Calcutta.

Gupta, B.N.: Statistics: Theory and Practice, Sahitya Bhawan, Agra (The Chapter on Indian Statistics)

Agarwal, B.L. Basic Statistics, Wiley Eastern Ltd.,

PRACTICAL

The students will be asked to attempt three exercises out of five exercises. The distribution of marks will be as follows:

	Regular Students	Ex-Students
(a) **Three Practical exercise**	**45 Marks**	**45 Marks**
(b) **Practical record work**	**10 Marks**	**-**
(c) **Viva-Voce**	**20 Marks**	**20 Marks**
Total	**75 Marks**	**65 Marks***

***To be converted out of 75 marks.**

The following topics are prescribed for practical works:

1. **Presentation of raw data.**
2. **Graphical representation by (i) Histogram (ii) Frequency Polygon (iii) Frequency curve and (iv) Ogives.**
3. **Diagrammatic representation by (i) Bars (ii) Pie-diagram.**
4. **Measures of central tendency: Mean, Median and Mode.**

5. **Measures of dispersion: (i) Range (ii) Inter-quartile range (iii) Mean deviation (iv) Variance and Standard deviation (v) Coefficient of variation.**
6. **Moments and various measures of skewness and kurtosis.**
7. **Exercises on determination of class frequencies, consistency of data and association of attributes.**
8. **Computations of death rates, birth rates, reproduction rates and construction of life tables.**
9. **Exercises on various types of index numbers.**

B.Sc. I Year

ZOOLOGY 2015

THEORY

Max. Marks (Min. Pass Marks: 54)

Paper I	: Animal Diversity and Evolution	50
Paper II	: Biology of Non chordates	50
Paper III	: Cell Biology and Genetics	50

PRACTICALS: Max. Marks   75
(Min Pass Marks: 27)

Duration of each theory paper   3 hours

Duration of practical examination   5 hours

Note: Each theory paper is divided in three parts i.e. Section-A, Section –B and Section –C.

Section-A: Will consist of 10 compulsory questions. There will be two questions from each unit and answer of each question shall be limited up to 30 words. Each question will carry of 1 mark.

Section –B: Will consist of 10 questions. Each unit will be having two questions; students will answer one question from each Unit. Answer of each question shall be limited up to 250 words. Each question carries 3.5 Marks.

Section-C: will consist of total 05 questions. Students will answer any 03 questions and answer of each question shall be limited up to 500 words. Each question carries 7.5 Marks.

PAPER I

Animal Diversity and Evolution

Functional morphology of the types included with special emphasis on the adaptations to their modes of life and environment. General characters and classifications of all invertebrate phyla up to class with examples emphasizing their biodiversity, economic importance and conservation measures where required.

Unit 1:   General principles of taxonomy, concept of the five-kingdom, Concept of Protozoa, Metazoa and Levels of organization. Basis of classification of non chordata: Symmetry, coelom, segmentation and embryogeny, Characters and Classification of Protozoa and Porifera upto classes with examples.

Unit 2: Salient features and classification of Coelenterata, Ctenophora, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca and Echinodermata with their suitable examples.

Unit 3:   Origin of Life, Miller's experiment, Lamarckism and Darwinism, Natural Selection, genetic basis of evolution, speciation, Evidences of organic evolution.

Unit 4:   Variations, Isolation and Adaptations, Geological time scale and animal distribution in different era.

Unit 5:   Principal zoogeographical regions of the world with special reference to their mammalian fauna, Factors affecting the large scale animal distribution, Origin and evolution of man.

PAPER II

Biology of Nonchordates

Unit 1 : *Euglena:* Ultrastructure of flagellum and flagellar movement, osmoregulation and behaviour, reproduction.
Paramecium: Locomotion, nutrition, osmoregulation and reproduction.
Sycon: Cellular organization, canal system, reproduction and development.

Unit 2 : *Obelia:* Structure of polyp and medusa, sense organs and reproductive systems, life cycle.
Fasciola: Digestive, excretory and reproductive systems, developmental stages and life cycle.
Taenia: Structure of body wall, excretory and nervous systems, reproduction and developmental stages in life cycle.

Unit 3 : *Nereis:* Parapodial locomotion, digestive, blood vascular, excretory, nervous and reproductive systems, development and metamorphosis.
Hirudinaria: Digestive, haemocoelomic, excretory, nervous and reproductive systems, sense organs.

Unit 4 : *Palaemon:* Appendages, Digestive, respiratory, blood – vascular, excretory, nervous, sense organs and reproductive systems.
Pila: Digestive, respiratory, blood vascular, nervous and reproductive systems, sense organs

Unit 5 : *Lamellidens*: Digestive, respiratory, blood–vascular, excretory and nervous systems, sense organs, reproduction and development.
Asterias: Water – vascular system, digestive, circulating and nervous systems, sense organs, reproduction, life history and regeneration.

PAPER III

Cell Biology and Genetics

Unit 1: Characteristics of prokaryotic and eukaryotic cells, Characteristics of cell membrane molecules, fluid-mosaic models of Singer and Nicolson, passive and active transport, Structures and functions of endoplasmic reticulum, ribosome, Golgi complex, lysosome, mitochondria, centriole, microtubules and nucleus.

Unit 2: Structure of Chromatin and Chromosomes, semiconservative mechanism of replication, elementary idea about topoisomerases, replication forks, leading and lagging strands, RNA primers and Okazaki fragments, RNA structure and types, mechanism of transcription, Genetic Code and protein synthesis.

Unit 3: Interphase nucleus and cell-cycle including regulation.
Mitosis: Phases and process of mitosis, structure and function of spindle apparatus, Theories of cytokinese.

Meiosis: Phases and process of meiosis, synaptonemal complex, formation and fate of chiasmata recombination and significance of crossing over.

Unit 4: Mendelism: Brief history of genetics and Mendel's work: Mendelian laws, their significance and current status, linked gene inheritance.
Chromosomal aberration: Structural - translocation, inversion, deletion and duplication; Numerical - haploidy, diploidy, polyploidy, aneuploidy, euploidy, polysomy and genetic implications.

Unit 5: Genetic interaction: supplementary genes, complementary genes, duplicate genes, multiple gene interaction, ABO blood groups and their genotypes, Multiple alleles.

PRACTICALS

1. Dissections [Major]:
   Palaemon: Study of appendages, general anatomy, digestive and nervous systems

   Pila: General anatomy and nervous system
   Lamellidens / Unio: General anatomy and nervous system
2. Permanent preparations / Minor dissections of the following:
   Protozoa: *Paramecium*
   Porifera: Sponge spicules, fibres and gemmules
   Coelenterata: *Obelia* colony, *Obelia* medusa
   Annelida: *Nereis* parapodia
   Arthropoda: *Palaemon*: Statocyst and hastate plate along with comb plates, *Cyclops* and *Daphnia*
   Mollusca: *Pila*: Gill lamella, radula and L. S. Osphradium, *Lamellidens*: Gill-lamella
3. Identification, systematic position up to order and general study of the following animal forms, microscopic slides / museum specimens:
   Protozoa: *Amoeba, Entamoeba, Euglena, Noctiluca, Trypanosoma, Trichomonas, Foraminifera* (Oozes)*, Opalina, Balantidium, Nyctotherus, Paramecium, Paramecium* binary fission and conjugation and, *Vorticella* [Whole mounts].
   Porifera: *Leucosolenia, Grantia, Scypha, Hyalonema, Euplectella, Spongilla* and *Euspongia*
   Coelenterata: *Obelia* (colony and medusa), *Physalia, Porpita, Aurelia, Rhizostoma, Alcyonium, Corallium, Gorgonia, Tubipora, Pennatulla* and *Madrepora*

Ctenophora: *Beroe*
Platyhelminthes: *Dugesia, Fasciola* and *Taenia*
Nematoda: *Ascaris, Ancylostoma, Dracunculus, Wuchereria, Trichinella, Schistosoma* and *Enterobius*
Annelida: *Nereis*, Phase Heteronereis, *Aphrodite, Arenicola, Pheretima, Pontobdella, Branchellion* and *Hirudinaria*
Onychophora: *Peripatus*
Arthropoda : *Limulus, Araneus, Palamnaeus, Apus, Lepas, Balanus, Sacculina, Palaemon, Lobster, Eupagurus, Carcinus, Lepisma, Odontotermes, Pediculus, Schistocerca, Papilio, Bombyx, Xenopsylla, Apis, Julus* and *Scolopendra*
Mollusca: *Chiton, Dentalium, Patella, Pila, Turbinella, Aplysia,* Slug, Snail, *Mytilus, Ostrea* (pearl oyster)*, Lamellidens, Teredo, Nautilus, Sepia, Octopus*

Enchinodermata: *Pentaceros, Asterias, Ophiothrix, Echinus, Holothuria* and *Antedon*

4. Study of sections, developmental stages and isolated structures from microscopic slides
Porifera: L. S. and T. S. of *Scypha / Grantia*
Coelenterata: *Hydra,* Sections of *Hydra,* Developmental stages of *Aurelia*
Platyhelminthes: Transverse sections of *Dugesia, Fasciola* and *Taenia*, mature and gravid proglottids of *Taenia*, developmental stages of *Fasciola* and *Taenia*
Annelida: Transverse sections of *Nereis* and *Hirudinaria*, Trochophore larva of Nereis, Parapodium of *Nereis* and *Heteronereis*
Arthropoda: Crustacean larvae (*Nauplius, Zoea, Megalopa* and *Mysis*), mosquito larva & pupa
Mollusca: Transverse sections of *Lamellidens* and Glochidium larva
Echinodermata: Pedicellariae of Star fish

5. Experimental Zoology:
   (i)   Test for Protein : Biuret
   (ii)   Test for Lipids : Sudan IV
   (iii)   Test for Carbohydrates : Benedict's
   (iv)   Demonstration of catalase enzyme activity in animal tissue
   (v)   Living study of *Paramecium*
   (vi)   Temporary acetocarmine squash preparations and study of chromosomes

Each regular student is required to keep a record of practical work done by him/her duly checked by the teachers which will be submitted at the time of practical examinations.

Distribution of Marks: Maximum Marks: 75
                                                          Minimum Pass Marks: 27

                                                          Regular   Ex.

Dissection [Major]	20	20
Permanent preparation / Minor Dissection (one)	08	10
Spots (seven)	21	21
Experimental Zoology	06	09
Viva-voce	10	15
Practical Record	10	---
Total	**75**	**75**

Recommended Books (All latest editions)
1. Prasad, Beni: *Pila*, Lucknow Publishing House, Lucknow.
2. Bhatia, M. L.: *Hirudinaria*, Lucknow Publishing House, Lucknow.
   3. De Robertis, E. D. P. and De Robertis, E. M. F.: *Cell and Molecular Biology*, Halt Saunder, Tokyo, Japan.
4. Gardner, E. J.: *Principles of Genetics*, John Wiley & Sons, New York.
5. Kotpal, R. L. : *Invertebrates*, Rastogi Publications, Meerut.
6. Nigam, H. C. : *A University Course in Invertebrate Zoology*, Vol. I, Mc Milan, London.
7. Prasad, S. N. : *Text Book of Invertebrate Zoology*, Kitab Mahal, Allahabad.
8. Patwardhan, S. S. : *Palaemon*, Lucknow Publishing House, Lucknow.
9. Reese, A. M. : *Outlines of Economic Zoology*, Blackiston Co., Philadelphia, U.S.A.
10. Vishwa Nath : *A Text Book of Zoology*, Vol. I, Invertebrate, S. Chand & Co., New Delhi.
11. Rastogi, Veerbala : *Invertebrate Zoology*, Kedar Nath Ram Nath, Delhi.
12. Jordan, E. L. and P. S. Verma: *Invertebrate Zoology*, S. Chand & Co. Ltd., Ram Nagar, New Delhi.
13. Alberts, B. *et.al. The Cell* (Garland).
14. Lodish, H., *et.al. Molecular Cell Biology* (Freeman).
15. Gupta, P. K., Genetics, Rastogi Publications, Meerut.
16. Rastogi, Veer Bala, Cell Biology, Kedar Nath Ram Nath, Delhi.