# JIWAJI UNIVERSITY

# GWALIOR

*Syllabus*

## SUBJECT

## B.Sc.
## I Year

## INSTITUTE OF

## DISTANCE EDUCATION

# B.A./B.Sc./B.Com. Part I

## PAPER - I : आधार पाठ्यक्रम

### HINDI LANGUAGE

खण्ड—एक : पाठ्य सामग्री

**इकाई—1**

| 1 | भारत वन्दना | : | सूर्यकान्त त्रिपाठी 'निराला' |
| 2 | स्वतन्त्रता पुकारती | : | जयशंकर 'प्रसाद' |
| 3 | बड़े घर की बेटी | : | प्रेमचन्द्र |

**इकाई—2**

| 4 | एक गधे की वापसी | : | कृभणचन्द्रर |
| 5 | टेलीफोन | : | हरिशंकर परसाई |
| 6. | अफसर | : | ारद जोशी |

**इकाई—3**

| 7 | सौंदर्य की नदी नर्मदा | : | अम  तलाल बेगड़ |
| 8 | बस्तर में बॉध | : | ानी |

**इकाई—4**

| 9 | बुद्ध की करूणा | : | डॉ. सह्वातिस्म |
| 10. | सादगी | : | महात्मा गॉधी |

**इकाई—5**

| 11 | योग की  ाक्ति | : | हरिवंशराय 'बच्चन' |
| 12 | शिकांगो से स्वामी विवेकानन्द का पत्र | | |

## खण्ड — 2 (हिन्दी भाषा) सम्प्रेषण कौशल

**इकाई—एक**

क.    मानक हिन्दी भा  ाा
ख.    अशुद्धियॉ और उनका संशोधन

**इकाई—दो**

क.    हिन्दी का   ाब्द भण्डार
ख.    हिन्दी की वाक्य रचना और विराह चिन्ह

**इकाई—तीन          पत्र लेखन, सार लेखन और पल्लवन**

क.    भारत देश और उसके निवासी
ख.    भारतीय समाज की संरचना
ग.    सामाजिक गतिशीलता
घ.    धर्म और दर्शन

**इकाई—पॉच**

क.    भारतीय संस्कृति का विश्व पर प्रभाव
ख.    मध्य प्रदेश का सांस्क  तिक वैभव

**Theory M.M. – 40**
**Assignment M.M. - 10**

**Structural Items**

(i)     Simple, compound and complex sentences.

(ii)    Co ordinate clauses (with but or Either-Or, Neither-Nor, Otherwise, Or else)

(iii)   Sub-ordinate clauses-noun clauses-as subject object and complement: Relative clouses (restrictive and non-restrictive clauses). Adverb clauses (open and hypothetical conditional, with because, though, here, so that, as long as, as soon as).

(iv)    Comparative Clauses (as+adjective/qdverb+as-to sooner...........that).

**Tenses-**

(i)     Simple present, progressive and present perfect

(ii)    Simple past, progressive and past perfect.

(iii)   Indication of Futurity.

        The passive (Simple present and past, present and past perfect and toinfinitive structure.

**Reported Speech-**

(i)     Declarative sentences

(ii)    Imperatives

(iii)    Introgatives-wh-question,  Yes/No Questions

(iv)    Exclamatory sentences.

        Models (will, shall, should, would, ought to has to have to ought, can could, may/might and need.)

(F)     Verb structures (infinitives and gerund)

(G)     Linking devices-

**Note:** The above language items will be introduced to express the following communicative functions-

(a)     Seeking and imparting information

(b)     Expressing attitudes-intellectual and emotional

(c)     Persuasion and dissuasion etc.


**Note:** Questions on all the units shall be asked from the prescribed text, which will comprise/specimens of popular creative writing and the following items:

(a)     Indian Art : Meaning of Art, Features of Indian Art, Elementary knowledge of paintings, Music, Dancing, Sculpture Archaeology, Iconography and Other Social Arts.

(b)     Indian Literature : Ancient Indian Literature, Elementary knowledge of Vedic Literature, Mahabharata, Ramayan and Other Main Granthas.

(c)     Indian Freedom Struggle: Freedom Struggle of 1857, National Consciousness Non-Co-operation Movement. Civil Disobedient Movement Quit India Movement Contribution of revolutionaries in freedom struggle.

(d)     Indian Constitution: Introduction, Main features of Constitution Fundamental Rights, Fundamental Duties.

सैद्धांतिक अंक – 40
परियोजना मूल्यांकन आंतरिक अंक – 10

**इकाई–1**
उद्यमिता – परिभाषा, विशेषताऐं एवं महत्व, एक उद्यमी के प्रकार एवं कार्य, एक अच्छे उद्यमी के गुण उद्यमिता अभिप्रेरणा घटक।

**इकाई–2**
महिला उद्यमिता – संभावनायें एवं समस्याऐं
एक व्यावसायिक अवसर हेतु खोज, अवसर के स्त्रोत, परियोजना अवसर का चयन।

**इकाई–3**
विस्तृत परियोजना प्रतिवेदन की तैयारी।
संगठन के प्रकार का चयन, एकाकी व्यवसाय, साझेदारी एवं सहकारी समिति का अर्थ एवं विशेषताएं संगठन के चयन को प्रभावित करने वाले घटक।

**इकाई–4**
नियामक संस्थाओं की भूमिका – जिला उद्योग केन्द्र, प्रदूषण नियंत्रक मण्डल, खाद्य एवं औषधि प्रशासन, विद्युत विभाग एवं नगर निगम का विशेषा अध्ययन।
विकासात्मक संस्थानों की भूमिका, खादी एवं ग्रामीण आयोग, म.प्र. वित्त निगम, अनुसूचित बैंक, म.प्र. का महिला आर्थिक विकास निगम।

**इकाई–5**
प्रेरणा एवं अनुदान – अर्थ एवं आवश्यकता, पूंजी निवेश अनुदान, ब्याज अनुमान, ऊर्जा अनुदान, अंशदान सहायता, महिला उद्यमियों हेतु विशेषा प्रेरणाऐं।
बृहद सरकारी योजनाएं – प्रधानमंत्री रोजगार योजना, स्वर्ण जयंती रोजगार योजना, रानी दुर्गावती स्वरोजगार योजना, दीनदयाल स्वरोजगार योजना।

# B.A./B.Com./B.Sc. I

## PAPER-III

### ENTREPRENEURSHIP DEVELOPMENT

Theory M.M. – 40
Assignment M.M. - 10

**Unit-1**
Entrepreneurship : Definition, Characteristics and significance. Types & functions of an entrepreneur, Qualities of a good Entrepreneur, Entrepreneurial motivation factors.

**Unit-II**
Women Entrepreneurship : Opportunities and problems.
Search for a business idea, sources of ideas, selection of project idea.

**Unit-III**
Preparation of detailed Project Report.
Selection of Types of organisation. Concept and characteristics of Sole Proprietorship, Partnership and Co-operative Society. Factors influencing the choice of organisation.

**Unit-IV**
Role of Regulatory institutions: Particular study of DIC, Pollution Control Board, Food and Drugs Administration, Electricity Board & Municipal Corporation.
Role of Promotional Institutions: KVIC, MPFC, Scheduled banks, Women Economic Development Corporation of MP.

**Unit -V**
Incentives and Subsidies: Concepts and needs. Capital Investment Subsidy, Interest Subsidy, Subsidy for power, Margin Money Assistance, Special incentives to Women Entrepreneurs.
Major Govt. Schemes: PMRY, SJRY, RDSY, Deendayal Swarojagar Yojana.

**Recommended Books -**
1.    Entrepreneurial Development by S.S. Khanka (S.Chand)
2.    Entrepreneurial Development by Taneja & Gupta (Galgotia Pub.)
3.    Entrepreneurial Development by Vasant Desai (Himalaya)
4.    Entrepreneurial Development in India by C.B. Gupta & Srinivasan (Sultan Chand & Sons)
5.    उद्यमिता विकास – जी.एस. सुधा (रमेश बुक डिपो)
6.    उद्यमी उद्योग और स्वरोजगार – सेडमेप 16–ए, अरेरा हिल्स, भोपाल।
7.    स्वरोजगार मार्गदर्शिका – तदैव
8.    उद्यमिता क्यों और कैसे – एम.पी. कॉन, गंगोत्री भवन, टी.टी. नगर, भोपाल।
9.    उद्यमिता (मासिक पत्रिका) उद्यमिता विकास केन्द्र, 16–ए, अरेरा हिल्स, भोपाल।

# B.Sc. Part 1 Mathematics

## BMG 101 Algebra and Trigonometry
**(Duration: One Year)**

**Unit I** : Linear independence of row and column matrices. Row rank, column rank and rank of a matrix, Equivalence of column and row ranks. Eigenvalues, eigenvectors and the characteristic equation of a matrix. Cayley Hamilton theorem and its use in finding inverse of a matrix.

**Unit II** : Application of matrices to a system of linear (both homogenous and non-homogeneous) equations. Theorems on consistency of a system of linear equations. Relations between the roots and coefficient of general polynomial equation in one variable. Transformation of equations. Descarte's rule of signs. Solution of cubic equation (Cardon method).

**Unit III** : Definition of a group with Examples and simple properties. Subgroups. Cyclic groups. Coset decomposition. Lagrange's theorem and its consequences. Fermat's and Euler's theorems. Homomorphism and isomorphism. Normal subgroups. Quotient groups.

**Unit IV** : The fundamental theorem of homomorphism. Permutation groups. Even and odd permutations. The alternating groups $A_n$ Cayley's theorem. Introduction to rings, subrings, integral domains and fields. Characteristic of a ring.

**Unit V** : De Movire's theorem and its applications. Direct and inverse circular and hyperbolic functions. Logarithm of a complex quantity. Expansion of trigonometrical functions.

**Text Books :**
1. L.N. Herstein, Topics in Algebra, Wiley Ltd., New Delhi, 1975
2. K.B. Datta, Matrix and Linear Algebra, Prentic Hall of India Pvt. Ltd., New Delhi, 2000.
3. Chandrika Prasad, Text-Book on Algebra and Theory of Equations Pothishala Private Ltd., Allahabad.
4. S.L. Loney, Plane Trigonometry Part II, Macmillan and Company, London.

**Reference Books :**
1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, First Course in Linear Algebra, Wiley Eastern, New Delhi, 1983.
2. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra (2nd Edition), Cambridge University Press, India Edition, 1997.
3. S.K. Jain, A. Gunawardena and P.B. Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing (Springer-Verlag), 2001
4. H.S. Hall and S.R. Knight, Higher Algebra, H.M. Publication, 1994.
5. R.S. Verma and K.S. Shukla, Text Book on Trigonometry, Pothishala Pvt. Ltd. Allahabad.

# B.Sc. Part 1 Mathematics

**BMG 102 Calcuns**

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**(Duration: One Year)**

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**Unit I** : Successive differentiation, Leibnitz theorem. Maclaurin and Taylor series expansions. Asymptotes.

**Unit II** : Curvature, Tests for concavity and convexity. Points of inflexion. Multiple points. Tracing of curves in Cartesian and polar coordinates.

**Unit III** : Definite integrals. Quadrature. Rectification Volumes and surfaces of solids of revolution.

**Unit IV** : Linear equation and equations reducible to the linear form. Exact differential equations. First order higher degree equations solvable of x. y. p. Clairaut's form and singular solutions. Geometrical meaning of a differential equation. Orthogonal trajectories.

**Unit V** : Linear differential equations with constant coefficients. Homogeneous linear ordinary differential equations. Linear differential equations of second order. Transformation of the equation by changing the dependent variable. The independent variable. Method of variation of parameters. Ordinary simultaneous differential equations.

**Text Books :**
1. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd. Allahabad.
2. Gorakh Prasad, Integral Calculus, Pothishala Private Ltd. Allahabad.
3. D.A. Murray, Introductory Course in Differential Equations, Orient Longman (India), 1967.

**Reference Books :**
1. Gabriel Klambauer, Mathematical Analysis Marcel Dekkar, Inc. New York, 1975.
2. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Peace Publishers, Moscow.
3. P.K. Jain and S.K. Kaushik, An Introduction to real Analysis, S.Chand & Co. New Delhi, 2000.
4. G.F. Simmons, An Introduction to ordinary differential Equations, Tata McGraw Hill, 1972.
5. E.A. Codington, An Introduction to ordinary differential Equation, Pretice Hall of India, 1961.
6. H.T.H. Piaggio, Elementary Treatise on Differential Euations and their Applications, C.B.S. Publisher & Distributors, Delhi, 1985.
7. W.E. Boyce and P.C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 1986.
8. Erwin Kreszig, advanced Engineering Mathematics, John Wiley and sons, 1999.

# B.Sc. Part 1 Mathematics

## BMG 103 Vector Analysis and Geometry

**(Duration: One Year)**

**Unit I** : Scalar and Vector product of three vectors, Product of four vectors, Reciprocal Vectors. Vector differentiation. Gradient, divergence and curl.

**Unit II** : Vector integration. Theorems of Gauss, Green, Strokes and problems based on these.

**Unit III** : General equation of second degree. Tracing of conics, System of conics. Confocal conics. Polar equation of a conic.

**Unit IV** : Equation of cone with given base, Generators of cone, condition for three mutually perpendicular generators. Right circular cone, Equation of cylinder and its properties.

**Unit V** : Central conicoids, Paraboloids. Plane Sections of Conicoids. Generating lines. Confocal Conicoids.

**Text Books :**
1. N. Saran and S.N. Nigam, Introduction to vector Analysis, Pothishala Pvt. Ltd., Allahabad.
2. Gorakh Prasad and H.C. Gupta, Text Book on Coordinate Geometry, Pothishala Pvt. Ltd. Allahabad.
3. N. Saran and R.S. Gupta, Analytical Geometry of Three Dimensions, Pothishala Pvt. Ltd. Allahabad (Unit IV).
4. R.J.T. Bell, Elementary Treatise on Coordinate Geometry of Three Dimensions, Macmillan India Ltd., 1994 (Unit V).

**Reference Books :**
1. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Publishing Company, New York.
2. Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 1999.
4. Shanti Narayan, A. Text Book of Vector Calculus, S. Chand & Co., New Delhi.
5. S.L. Loney, The Elements of Coordinate Geometry, Macmillan and Company, London.
6. P.K. Jain and Khalil Ahmad, A text book of Analytical Geometry of Two Dimensions,Macmillan India Ltd., 1994.
7. P.K. Jain and Khalil Ahmad, A text book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd., 1999.

**PAPER I Physical Chemistry**

**MM 33**                                                                 **60 Hrs (2Hrs/week)**

**Unit I      :     Mathematical Concepts and Computers        16 Hrs**
Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like $k_x$, $e^x$, $x^n$, sin x, log x, maxima and minima, partial differentiation and reciprocity relations, Integration of some useful/relevant functions; permutations and combinations. Factorials. Probability.

General Introduction to computers, different components of a computer, hardware and software, input- output devices, binary numbers and arithmetic; introduction to computer languages. Programming operating systems.

**Unit II        Gaseous States                              8 Hrs.**
Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state.

*Critical Phenomena :* PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

*Molecular Velocities :* Root mean square, average and most probable velocities. 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).

**Unit III        Liquid State & Colloidal                    6 Hrs**
Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

Defination of colloids, classification of colloids.

Solids in Liquids (sols) : properties - kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze law, gold number. I Liquids in liquids (emulsions) : types of emulsions, preparation. Emulsifier.

Liquids in solids (gels) : classification, preparation and properties, inhibition, general applications of colloids.

**Unit IV        Solid State                                  11 Hrs**
Defination of space lattice, unit cell.
Laws of crystallography -
(i)  Law of constancy of interfacial angles.
(ii) Law of rationality of indices.
(iii)Law        of       symmetry.      Symmetry      elements      in
     crystals.
X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCI, KCI and CsCI (Laue's method and powder method).

**Unit V**        **Chemical Kinetics and Catalysis**        **13 Hrs**

Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a react on - concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions- zero, order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction - differential method, method of integration, method of half life period and isolation method.

Radioactive decay as a first order phenomenon.

Experimental methods of chemical kinetics : conductometric, potentiometric, optical methods, polarimetry and spectrophotometer.

Theories of chemical kinetics : effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Catalysis, characteristics of catalysed reactions, classification of catalysis, miscellaneous 'examples'.

## PAPER II     Inorganic Chemistry
### MM 33        60 Hrs (2Hrs/week)

**Unit I**        **Atomic Structure**                **12 Hrs**

Idea of de Broglie matter waves, Heisenberg uncertainly principle, atomic orbitals, Schrodinger wave equation, significance of $\Psi$ and $\Psi^2$, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic conf, gurations of the elements, effective nuclear charge.

Periodic Properties.

Atomic and ionic radii, ionization energy, electron affinity and electronegativity defination, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

**Unit II**        **Chemical Bonding- Part I**           **13 Hrs**

Covalent Bond - Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) Theory to $NH_3$, $H_3O+$, $SF_4$, $CIF_3$, $ICI_2^{11}$ and $H_2O$, MO theory, homonuclear and heteronuclear (CO and NO) diatomic, molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Weak Interactions - Hydrogen bonding, van der Waals force.

**Unit III**       **Chemical Bonding-Part II & s-Block Elements**    **13 Hrs**

Ionic Solids - Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattics energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions.

Fajan's rule. Metallic bond-free electron, valence bond and band theories.

s-Block Elements.

Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryis.

**Unit IV**        **p-Block Elements**      **Part-I**           **13 Hrs**

Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxies, oxyacids and halides of groups 13-18, hydrides of boron-diborance and higher boranes, borazine, borohydrides

**Unit IV**        **p-Block Elements**     **Part-II & Chemistry of Noble Gases**
###                                    **13 Hrs**

Fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens. Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

## PAPER III    Organic Chemistry
### MM 33          60 Hrs (2Hrs/week)

**Unit I          Structure and Bonding                    13 Hrs**

Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity... inductive and field effects, hydrogen bonding.

**Mechanism of Organic Reactions**

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents- electrophiles and nucleophiles. Types of organic reactions, Energy consideration.

Reactive intermediates carbocations, carbanions, freeradicals, carbenes arynes and... nitrene with example). Assigning formal charges on intermediates and other ionic species.

Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

**Unit II          Stereochemistry of Organic Compounds          12 Hrs**

Concept of isomerism. Types of isomerism.

Optical isomerism elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, 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 nomenclature. Geometric isomerism - determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism - conformational analysis of ethane and n-butane; conformation of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Newman projection and Sawhorse formulae. Fischer and flying wedge formulae.

Difference between configuration and conformation.

**Unit III          Alkanes and Cycloalkanes                    15 Hrs**

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes.

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

**Arenes and Aromaticity**

Nomenclature of benzene derivatives. The aryl groups. 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 (a and n complexes). Mechanism of nitration, halogenation, sulfonation, mercuration and Friedel- Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Slide chain reactions of benzene derivatives. Birch reduction.

Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

**Unit IV**  **Alkenes, Cycloalkenes, Dienes and Alkynes**  **12 Hrs**

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff rule. Hofman elimination, physical properties and relative stabilities of alkenes.

Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation with KMnO4, Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

Methods of formation, conformation and chemical reactions O, f cycloalkenes. 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. DielsAlder reaction.

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reduction, oxidation and polymerization.

**Unit V**  **Alkyl and Aryl Halides**  **8 Hrs**

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions.

Polyhalogen compounds : chloroform, carbon tetrachloride.

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. Synthesis and uses of DDT and BHC Freons.

**Practicals**                                                                                    **180 Hrs**

**Inorganic**                                             **12 Marks**

Macro/Semimicro Analysis - cationanalysis, separation and identification of ions from group I, II, III, IV, V and VI. Anions Analysis.

**Organic Chemistry**                                     **12 Marks**
1.    Calibration of Thermometer
2.    Determination of Melting Points.
3.    Determination of Boiling Points.
4.    Mixed melting Points Determination.
5.    Distillation
6.    Crystallization
7.    Decolorisation and Crystallization using charcoal.
8.    Sublimation
9.    Qulititative Analysis
         Detection of extra elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.

## Practicals Chemistry

**Chemical Kinetics**                                     **12 Marks**
1.    To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2.    To study the effect of acid strength on the hydrolysis on an ester.
3.    To compare the strengths of HCI and H2so4 by studying the kinetics of hydrolysis of ester.
4.    To study kinetically the reaction rate of decomposition of iodide by H2O2.

**Distribution Law**
1.    To study the distribution of iodine between water and CCI4.
2.    To study the distribution of benzoic acid between benzene and water.

**Colloids**
1.    To prepare arsenious sulphide sol and compare the precipitating power of monobi and trivalent anions.

**Viscosity, Surface Tension**
1.    To determine the percentage composition of a given mixture (non interacting systems) by viscosity method.
2.    To determine the viscosity of amyl alcohol in water at different concentrations and calculate the excess viscosity of these solutions.
3.    To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).

## Course 1 : MECHANICS, OSCILLATIONS AND PRIORITIES OF MATTER NUMERICALS PROBLEMS BASED ON THE TOPICS MUST BE ASKED IN EACH UNIT

**1.1**       **Mechanics**                                 **20**

Laws of motion, motion in a uniform field, components of velocity and acceleration in different coordinate systems. Uniformly rotating frame, centripetal acceleration, Coriolis force and its applications. Motion under a central force, Kepler's law. Gravitational law and field. Potential due to a spherical body.

Gauss and Poisson equations for gravitational self-energy.

System of particles, center of mass, equation of motion, conservation of linear and angular moments, conservation of energy, sigle-stage and multistage rockets, elastic and inelastic collisions.

**1.2**       **Oscillations and Rigid Body Motion**            **20**

Rigid body motion, rotational motion, moments of inertia and their products, principal moments and axes. Euler's equation.

Potential well and periodic oscillations, case of harmonic oscillations, differential equation and its polution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsional pendulum, bifilar oscillations, Helmholtz resonator, LC circuit, librations of a magnet, oscillations of two masses connected by a spring.

**1.3**       **Super Position of Hormonic Motion**           **15**

Superposition of two simple harmonic motions of the same frequency along the same line, interference, perposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous gures, case of different frequencies.

Two coupled oscillators, normal modes, N couled oscillators, damped harmonic oscillations, power dissipation, quality factor, examples, driven harmonic oscillator, transient and steady states, power sorption, resonance in systems with many degrees of freedom.

**1.4**       **Mechanics**

: The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned which are indicated as applications of principles involved).

As an accelerating field, electron gun, case of discharge tube; linear accelerator. E as deflecting field O, sensitivity, fast CRO.

Transverse B field; $180^0$ deflection, mass spectrograph or velocity selector, curvatures of tracks for energy determination for nuclear particles; principles of a cyclotron.

Mutually perpendicular E and B fields - velocity selector, its resolution.

Parallel E and B fields; positive ra parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focusing (lens).

**1.5    Properities of Matter                    13**

Elasticity, small deformation, Hook's law, elastic constrans for an isotropic solid, beams supported at both the ends, cantilever, toralon of a cylinder, bending moments and ahearing foren.

Kinematics of moving fluids, equations of continuity, Euler's equation, Bernaulli's theorm, viscous fluids, streamline and turbulent flow, Poisculle's law. Capaillary tube flow, Reynold's number, Stokes law.

Surface tension and surface energy, molecular interpretation of surface tension, pressure on a curved liquids surface, wetting.

**Text and Reference Books**

E.M. Purcell, Ed : "Berkeley Physics Course, Vol. 1, Mechnics" (McGraw-Hill)

R.P. Feymman, R.B. Lighton and M. Sands : The Feymman Lectures in Physics". Vol. 1 (B I Publications, Bombay, Delhi, Calcutta, Madras).

D.P. Khandelwal : "Oscillations and Waves" (Himalaya Publishing House, Bombay).

R.K. Ghosh : "The Mathematics of Waves and Vibration" (Mecmillan 1975)

## Course 2 : ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY NUMERICALS PROBLEMS BASED ON THE TOPICS MUST BE ASKED IN EACH UNIT

**2.1    Mathematical Background                    20**

Scalars and vectors, dot and cross products, triple vector product, gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, line surface and volume integrals, flux of a vector field, Gauss's divergence theorem, Green's theorem and Stokes theorem.

Functions of two and three variables, partial derivatives, geometrical interpretation of partial dervatives of functions of two variables. Total differential of a function of two and three variables, higher order derivatives, applications.

Repeated integrals of a function of more than one variables, defination of a double and a triple integral, evaluation of double and triple integrals as repeated integrals, change of variables of integration, Jacobian applications.

**2.2    Electrostatics                    30**

Coulombs law in vaccum expressed in vector forms, calculations of E for simple distributions of charged at rest, dipole and quadrupole fields.

Work done on a charge in an electrostatic field expressed as a line integra, conservative nature of the electrostatic field. Electric potential $\Phi$ E = _ V $\Phi$, torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application form finding E for Symmetric charge distributions, Gaussian pillbox, fields at the surface of a conductor, screening of E field by a conductor, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a grounded infinite conductor.

Dielectrics, parallel plate capacitor with adielectric, dielectric constant, polarization and polarization vector, displacement vector D, molecular interpretation of Claussius- Mossotti equation, boundary conditions satisfied by E and D at the interface between two hormogenous dielectrics, illustration through a simple example.

**2.3      Electric Currents (steady and alternation)                    30**
Steady current, current density J, non-steady currents and continuity equation, Kircholts law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constant, tansients in LCR circuits, AC circuits, complex numbers and their applications solving AC circuits problems, complex apedance and reactance, series and parellel resonance, Q factor, power consumed by an AC circuit, power factor, Y and networks and transmission of electric power.

**2.4      Magnetostatics**
Force on a movind charge; Lorentz force equation and defination of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic diploc moment, angulr momentum and gyromagnetic ratio.
Piot and Savart's Law, calculation of H order in simple geometrical situations, Ampere's Law $V.B = 0$, $V K B = \mu . J$. Field due to a magnetic dipole, magnetization current, magnetization vector, Half order field, magnetic permeability (linear cases), interpretation of a bar magnet as a surface distribution of solenoidal current.

**2.5      Time Varying Fields and Electromagnetic Waves                    20**
Electromagnetic induction, Faraday's law, electromotive force, $\Sigma = f$ E.dr., integral and differential forms of Faraday's law, mutual and self inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density.
The wave equation satisfied by E and B, plane electromagnetic wave in vacuum, Poynting's vector, reflaction at a plane boundary of dielectrics, polarization by reflection and total internal reflection. Faraday effect, waves in a counducting medium, reflection and refraction by the ionosphere.

**Text and Reference Books**
Berkeley Physics Course; Electricity and Magnetism, Ed. E.M. Purcell (McGraw-Hill)
Halliday and Resnik, "Physics", Vol.2.
D.J. Griffith; "Introduction to Electrodynamics" (Prentice Hall of India)
Reitz and Milford, "Electricity and Magnetism (Addition- Wesley)
A. S. Mahajan and A.A. Rangwala; "Electricity and Magnetism" (Tata McGraw-Hill)
A.M. Portis; "Electromagnetic Fields".
Pugh and Pugh, "Principles of Electricity and Mangnetism" (Addison- Welsley).
Panofsky and Phillips, "Classical Electricity and Magnetism" (India Book House).
S. S. Atwood; "Electricity and Magnetism" (Dover).

## Course 3  LABORATORY I

18 experiments should be performed

**Mechanics, Oscillation and Properties of Matter**

**3.1.1     Mechanics**

Study of laws of parellel and perpendicular axes for moment of inertia.

Study of conservation of momentum in two dimensional oscillations.

**3.1.2     Oscillations**

Study of a compound pendulum.

Study of damping of a bar pendulum under various mechanics.

Study of oscillations under a bifilar suspension.

Potential energy curves of a I-Double system and oscillation in it for various amplitudes.

Study of oscillations of a mass under different combination of springs.

**3.1.3     Properties of Matter**

Study of bending of a cantilever or a beam.

Study of torsion of a wire (static and dynamic methods)

Study of flow of liquids through capillaries.

Determination of surface tension of a liquid by different methods.

Study of viscosity of a fluid by different methods.

**3.2.1     Electricity, Magnetism and Electromagnetic Theory 3.2.1 Electrostatics**

1.      Characteristics of a ballistic galvanometer.
2.      Setting up and using an electroscope or electrometer.

**3.2.2     Moving Charges and Magnetosiatics**

1.      Use of a vibration magnetometer to study a field.
2.      Study of B field due to current.
3.      Measurement of low resistant by Carey-Foster bridge or otherwise.
4.      Measurement of inductance using impendance at different frequencies.
5.      Measurement of capacitance using, impedance at different frequencies.
6.      Study of decay of currents in LR and RC circuits.
7.      Response curve for LCR circuit and resonance frequency and quality factor.

**3.2.3     Varying Fields and Electromagnetic Theory**

1.      Sensitivity of a cathode-ray oscilloscope.
2.      Characteristics of a choke.
3.      Measurement of inductance.
4.      Study of Lorentz force.
5.      Study of discrete and continouse LC transmission lines.

**3.3      Computer Programming I**

1. Elementary Fonran programms, flowchans and their interpretation.
2. To print out all natural even/odd numbers between given limits.
3. To find maximum, minimum and range of a given set of numbers.
4. To compile a frequency distribution and evaluate moments such as mean; standard deviation etc.
5. To evaluate sum of finite series and the area under a curve.
6. To find the product of two matrices.        7. To find a set of prime numbers and Fibonacci series.
8. Motion of a projective using computer simulation.
9. Numerical solution of equation of motion.
10. Motion of panicle in a central force field.
11. To find the roots of a quadratic equation.

**Text and Reference Books**

B Saraetal; "Mechanical System" (Vikas Publishing House, New Delhi)

D.P. Khandelwal; "A Laboratory Manual of Physics for undergraduate Classes" (Vani Publication House, New Delhi)

C.G. Lambe; "Elements of Statistics" (Longmans Green and Co. London, New York, Toronto)

C. Dixon; "Numerical Analysis"

S. Lipsdutz and A Poe; "Schaum's Outline of Theory and Problems of Programming with Fortran" (McGraw- Hill Book Company, Singapore 1986)

### Paper – Ist : Mechanics, Oscillations and Priorities of Matter Numericals Problems based on the Topics must be asked in each unit

### Unit – 1 : Mechanics

Laws of motion, motion in a uniform field, components of velocity and acceleration in different coordinate systems. Uniformly rotating frame, centripetal acceleration, Coriolis force and its applications. Motion under a central force, Kepler's law, Gravitational law and field. Potential due to a spherical body. Gauss and Poisson equations for gravitational self-energy.

System of particles, center of mass, equation of motion, conservation of linear and angular moments, conservation of energy, single-stage and multistage rockets, elastic and inelastic collisions.

### Unit – 2 : Oscillations and Rigid Body Motion

Rigid body motion, rotational motion, moments of inertia and their products, principle moments and axes. Ruler's equations.

Potential well and periodic oscillations, case of harmonic oscillations, differential equation and its pollution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsional pendulum, bifilar oscillations, Helmholtz resonator, LC circuit, vibrations of a magnet, oscillations two masses connected by a spring.

### Unit – 3 Super Position of Hormonic Motion:

Superposition of two simple hormonal mothios of the same frequency along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous gures, case of different frequencies.

No coupled oscillators, normal modes, N couled oscillators, damped harmonic oscillators, power absorption, quality factor, examples, driven harmonic oscillator, transient and steady states, power absorption resonance in systems with many degrees of freedom.

### Unit – 4 Motion of charged particles in Electric and Magnetic Fields

The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned which are indicated as applications of principles involved.)

As an accelerating field, electron gun, case of discharge tube; linear accelerator, E as deflecting field- CRO, sensitivity, Fast CRO.

Transverse B field: $180^0$ deflection, mass spectrograph or velocity selector, curvatures of tracks for energy determination for nuclear particles; principles of a cyclotron.

Mutually perpendicular E and B fields- velocity selector, its resolution.

Parallel E and B field; positive ra parabolas, discovery of isotopes, elements of mass spectrography, principle of magnetic focusing (lens).

### Unit – 5 Properties of matter

Elasticity, small deformations, Hook's law, elastic constrans for an isotropic solic, beams supported at both the ends, condlever, toralon of a cylinder, bending moments and ahearing .....

Kinematics of moving fluids, equations of continutity, Euler's equation, Bernaulli's theorm, viscous fluds, streamline and turbulent flow, poisculle's law. Capaillary tube flow, Reynold's number, Stokes law.

Surface tension and surface energy, molecular interpretation of surface tension. Pressure on a curved liquids surface, wetting.

# B. Sc. Ist Year (PCM)
## Physics
### Paper –IInd : Mechanics, Oscillations and Priorities of Matter Numericals Problems based on the Topics must be asked in each unit

### Unit – 1 Mathematics Background
Scalars and vectors, dot and cross products, triple vector product, gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field, line surface and volume integrals, flux of a vector field, Gauss's divergence theorem, Green's theorem and Stokes theorem.

Functions of two and three variables, partial derivatives, geometrical interpretation of partial derivatives of functions of two variables. Total differential of a function of two and three variables, higher order derivatives, applications.

Repeated iintegrals of a function of more than one variables, definition of a double and a triple integral, evaluation of double and triple integrals as repeated integrals, change of variables of integration, Jacobian applications.

### Unit – 2 Electrostatics
Coulombs law in vaccum expressed in vector forms, calculations of E for simple distributions of charged at rest, dipole and quadrupole fields.

Work done on a charge in an electrostatic field expressed as a line integra, conservative nature of the electrostatic field. Electric potential $\phi$ E= -V$\phi$, torque on a diple in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application for finding E for Symmetric charge distributions, Gaussian pillbox, fields at the surface of a conductor, screening of E field by a conductor, capacitors, electrostatic field energy, force per unit area of the surface of a conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a grounded infinite conductor.

Dielectrics, parallel plate capacitor with adielectric, dielectric constant, polarization and polarization vector, displacement vector D, molecular interpretation of Claussius-Mossotti equation, boundary conditions satisfied by E and D at the interface between two hormogenous dielectries, illustration though a simple example.

### Unit – 3 Electric Currents (steady and alternation)
Steadh current, current density J, non-steady currents and continuity equation, Kirchoffs law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits, AC circuits, complex numbers and their applications solving AC circuits problems, complex pedance and reactance, series and parallel resonance, Q factor, power consumed by an AC circuits power factor, Y and $\Delta$ networks and transmission of electric power.

### Unit – 4 Maguetostatics
Force on a movind change; Lorentz force quation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic diploe moment, angulrnomentum and gyromagnetic ratio.

Pilot and Savart's Law, calculation of H order in simple geometrical situations, Ampere's Law VB=0, V k B = $\mu$. J. field due to a magnetic dipole, magnetization current, magnetization vector, Half order field, magnetic permeability (linear cases), interpretation of a bar magnet as a surface distribution of consolenoidal current.

### Unit – 5 Time Varying Fields and Electromagnetic Waves.
Electromagnetic induction, Faraday's law, electromotive force, $\mathcal{E} = f$ E.dr., integral and differential forms of Faraday's law, mutual and self inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell;s equations, electromagnetic field energy density.

The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, poynting's vector, reflection at a plane boundary of dielectrics, polarization by reflection and total internal reflection. Faraday effect, waves in a conducting medium, reflection and refraction by the ionosphere.

# B. Sc. Part I Botany - Paper I
# DIVERSITY OF MICROBES AND CRYPTOGAMS

**MM : 50**

**Unit I**  Viruses and Bacteria; General account of viruses and mycoplasma; bacteria- structure, nutrition, reproduction and economic importance; general account of cyanabacteria.

**Unit II**  Algae; General characters, classification and economic importance; important features and life history of Chlorophyceae - Volvox, Oedogonium, Coleochaete; Chara, Xanthophyceae - Vaucheria; Phaeophyceae - Ectocarpus, Sargassum; Rhodophyceae - Polysiphonia.

**Unit III**  Fungi; General characters, classification and economic importance; important features and life history of Mastigomycotina - Pythium, Phytophthora; Zygomycotina - Mucor, Ascomycotina - Saccharomyces, Aspergillus, Chaetomium, Peziza; Basidiomycotina - Puccunia, Agaricus; Deutermycotina - Cercospora, Colletotrichum; general account of Lichens.

**Unit IV**  Bryophyta; alternation of generation; structure, reproduction and classification of Hepaticopsida (e.g. marchantia); Anthocerotopsida (e.g. Anthoceros), Bryopsida (e.g. Polytrichum).

**Unit V**  Pteridophyta; Important characteristics of Psilopsida, Lycopsida, Sphenopsida and Pteropsida; structure, reproduction in Rhynia, Lycopodium, Selaginella, Equisetum and Marsilea, Stelar Organization.

**Suggested Readings**

1. Smith, G.M. 1971, Cryptogamic Botany, Vol. 1. Algae & Fungi. Tata McGraw Hill Publishing Co., New Delhi.
2. Smith, G.M. 1971, Cryptogamic Botany, Vol II. Bryophytes & Pteridophytes, Tata McGraw Hill Publishing Co., New Delhi.
3. Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Publishing Co.
4. Sharma, O.P. 1990. Text Book of Pteridophyta. McMillian India Ltd.
5. Sharma, P.D. 1991. The Fungi. Rastogi & Co., Meerut.
6. Dube, H.C. 1990. An Introduction to Fungi. Vikas Publishing House Pvt. Ltd., Delhi.
7. Puri, P. 1980. Bryophyta. Atma Ram & Sons, Delhi
8. Clifton, A. 1958. Introduction to the Bacteria. McGraw Hill & Co., New Delhi.

**Suggested Laboratory Exercises**

1. Study of the genera included under algae and fungi.
2. Study of morphology, reproductive structures and anatomy of the examples cited in theory under Bryophyta and Pteridophyta.
3. Observation of disease symptoms in hosts infected by fungi, viruses and mycoplasma. Section cutting of diseased material and identification of the pathogens as per the theory syllabus.
4. Gram staining of bacteria.
5. Study of crustose, foliose and other types of lichen thalli.

# B. Sc. Part I Botany - Paper II
# CELL BIOLOGY AND GENETICS

**MM : 50**

**Unit I**          The cell envelops; Plasma membrane; bilayer lipid structure; functions; the cell wall.

Structure and function of other organelles; Golgi, ER, peroxisomes, vacuoles.

Structure and function of nucleus; Ultrastructure; nuclear membrane; nucleolus.

**Unit II**          Chromosome organization; Morphology; centromere and telomere. Special types of chromosomes, Mitosis, Meiosis, Extranuclear genome; Presence and function of mitochondria and plastid DNA; Plasmids.

**Unit III**          Chromosomal alterations' deletions; duplications; translocations, inversions; variations in chromosome number, aneuploidy, polyploidy, sex chromosomes.

**Unit IV**          DNA the genetic material; DNA Structure; replication; DNA-protein interaction; the nucleosome model; genetic code; satellite and repetitive DNA. Gene expression; Structure of gene; transfer of genetic information; transcription; translation, protein synthesis; tRNA; ribosomes; regulation of gene expression in prokaryotes and eukaryotes; proteins, 1D, 2D and 3D Structure.

**Unit V**          Genetic inheritance; Mendelism; Laws of segregation and independent assortment; linkage analysis; allelic and non-allelic interactions.

Genetic variations; Mutations, spontaneous and induced; transposable genetic elements; DNA damage and repair.

Teachers should cover historical aspects and the basic experiments
that led to major discoveries.

**Suggested Readings**

Alberts, B.D. Lewis, J.Raff, M. Roberts, K and Watson, I.D. 1999. Molecular Biology of Cell, Garland Publishing Co. Inc. New York, USA.

Atherly, A.G. Girton, J.R. and McConald, J.F. 1999. The Science of Genetics, Saunders College Publishing, Fort Worth, USA.

Gupta, P.K. 1999. A Text-book of Cell and Molecular Biology, Rastogi Publications, Meerut, India.

Kleinsmith, L.J. and Kish, V.M. 1995. Principles of Cell and Molecular Biology (2nd edition). Harper Colling College Publishers, New York, USA.

Russel, P.J. 1998. Genetics. He Benjamin/Cummings Publishing Co. Inc., USA.

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

Stent, G.S. 1986. Molecular Genetics. CBS Publications.

Wolfe, S.L. 1993 Molecular and Cell Biology. Wadsworth Publishing Co., California, USA.

**Suggested Laboratory Exercise**

1. To study cell structure from onion leaf peels; demonstration of staining and mounting methods.
2. Comparative study of cell structure in onion cells, Hydrilla and Spirogya. Study of cyclosis in Tradescantia staminal cells.
3. Study of plastids to examine pigment distribution in plants (e.g. Cassia, Lycopersicon and Capsicum).
4. Examination electron micrographs of eukayotic cells with special reference to organelles.
5. Study of electron micrographs of viruses, bacteria, cyanobacteria and eukaryotic cells for comparative cellular organization.
6. Examination of various stages of mitosis and meiosis using appropriate plant material (e.g. onion root tips, onion flower buds).
7. Preparation of karyotypes from dividing root tip cells and pollen grains.
8. Cytological examination of special types of chromosomes; bar body, lampbrush and polyten chromosomes.
9. Working out the laws of inheritance using seed mixtures.
10. Working out the mode of inheritance of linked genes from test cross and/or F2 data.

**Suggested Readings (for Laboratory Exercise)**

Fulkui, K. and Nakayama, S. 1996. Plant chromosomes; Laboratory Methods. CRC Press. Boea Raton, Florida, Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology; Structure and Function. Jones and Barlett Publishers, Boston Massachusetts.

Herris, N. and Oparka, K.J. 1994. Plant Cell Biology; A Practical Approach. IRL Press, at Oxford University Press, Oxford, UK.

Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes; Analysis, Manipulation and Engineering, Harwood Academic Publishers, Australia.

# B. Sc. Part I
## SCHEME OF PRACTICAL EXAMINATION

**Time: 4 Hours; MM: 50**

| | | |
|---|---|---|
| Algae/Fungi | - | 05 |
| Bryophyta | - | 05 |
| Pteridophyta | - | 05 |
| Mitosis/Meiosis | - | 05 |
| Genetical Problem | - | 05 |
| Plant Diseases | - | 05 |
| Spotting | - | 05 |
| Project | - | 05 |
| Record | - | <u>05</u> |
| | | <u>50</u> |

The Project may include any of the following :-
1. An innovation such as a graft hybrid.
2. Collection of plant materials for class use.
3. Preparation of charts of life cycles.
4. Preparation of models and museum specimens of plants and plant parts.
5. Preparation of photographs or line diagrams of plants in situ or from preserved specimens.
6. Mushroom culture & Techniques of Bonsai plants.


## SCHEME OF PRACTICAL EXAMINATION
### B. Sc. First Year
### ZOOLOGY

**Time: 4 Hours; MM: 50**

| | | |
|---|---|---|
| Major Dissection | - | 08 |
| Minor Dissection | - | 04 |
| Mounting | - | 04 |
| Spotting - (08 Spots) | - | 16 |
| (4 Slides, 2 Bones and 2 Museum Specimens) | | |
| Cytology | - | 04 |
| Embryology | - | 04 |
| Viva | - | 05 |
| Field Work Report and Practical Record | - | 05 |

# B. Sc. First Year
## ZOOLOGY
### Paper- I
### LIFE AND DIVERSITY OF ANIMALS

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

**Unit - I**

1. Classification of Non- chordates upto orders                according to Parker and Haswell. 7th Edition.
2. Protozoa - Types study of Plasmodium.
3. Porifera - Types study of Sycon.
4. Coelenterata - Type study of Obelia.
5. Helminths - Type study of Liverfluke.

**Unit - II**

1. Annelida - Type study of Nereis, metamerism,                Trochophore larva.
2. Arthropoda - Type study of Prawn.
3. Mollusca - Type study of Pila.
4. Echinodermata - External features of Star fish and                Echinoderm Larvac.

**Unit - III**

1. Origin of Chordates Classification of phylum                chordata upto orders according to Parkar and                Haswell, 7th Edition.
2. Hemi chordata - External features of Balanoglossus,
   Affinities of Balanoglossus.
3. Urochordata - Type study of Herdmania (Excluding
   Development).
4. Cephalochordata    -    Type    study    of    Amphioxus.
   Affinities of Amphioxus.

**Unit - IV**

1. Agnatha -     (a)  Petromyzon - External Features.
                 (b)Comparison between Petromyzon
   and Myxine.
2. Comparative    Anatomy    of    following    systems    of
   vertebrates    (Fish,    Amphibia,    Reptiles,    Birds    and
   Mammals).
                 (a)  Intergumentary System
                 (b)  Skeletal System - Girdles Only
                 (c)  Digestive System.

**Unit - V**

          Comparative anatomy of the following systems of vertebrates (Fish, Amphibia, Reptiles, Birds and Mammals).
                 (a)     Respiratory System.
                 (b)     Circulatory System - Heart and Aortic
                         arches only.
                 (c)     Nervous System - Brain Only.
                 (d)     Urinogenital System.

# B. Sc. First Year
## ZOOLOGY
### Paper- II
### CELL AND DEVELOPMENTAL BIOLOGY

**Unit - I**

1. The Cell - History of Cell Biology, Cell theory, Prokaryotic and Eukaryotic Cells.
2. Methods in Cell Biology - Microscopy - Compound Microscopy and Electron Microscopy.
3. Organisation of Cell - Nuclear and Extra Nuclear.

**Unit - II**

1. Cell Reproduction - Amitosis, Mitosis and Meiosis.
2. Elementary idea of Cell Transformation and Cancer
3. Elementary idea of Cellular basis of Immunity, Immunocytochemistry, Immunoglobulins.

**Unit - III**

1. Historical Perspective, aims and scope of Development Biology.
2. Parthenogenesis.
3. Gametogenesis.
4. Fertilization.
5. Types and Patterns of Cleavage.

**Unit - IV**

1. Process of Blastulation and Fate map Construction in Frog and Chick.
2. Gastrulation in Frog and Chick upto the Formation of Germinal Layers.
3. Concept of Competence, Determination and Differentiation.

**Unit - V**

1. Extraembryonic Membranes in Chick.
2. Placentation in Mammals.
3. Retrogressive Metamorphosis in Herdmania.
4. Concept of Regeneration.
5. Basic Concept of Biotechnology and Biodiversity.

## LIST OF RECOMMENDED BOOKS
## (All Latest Editions)

1. Parker and Haswell, Text Book of Zoology, Vol I (Invertebrate) 7th Edition A.Z.T.B.S. Publishers and Distributors, New Delhi 110051.
2. Parker and Haswell, Text Book of Text Book of Zoology, Vol II (Chordata) A.Z.T.B.S. Publishers and Distributors,New Delhi 110051.
3. Hickman C.P. Jr. F.M. Hickman and L.S. Roberts, Integrated Principles of Zoology, Mosby College Publications, St. Louis.
4. Ayyar, E.K. and T.N. Ananthakrishnan, Manual of Zoology, Vol I (Invertebrate), Parts I & II, S. Vishwanathan (Printers and Publishers) Pvt. Ltd., Madras.
5. Ayyar, E.K. and T.N. Ananthakrishnan, Manual of Zoology, Vol II (Chordata), Vishwanathan (Printers and Publishers) Pvt. Ltd., Madras.
6. Jordan, E.L. and P.S. Verma, Inverbrate Zoology, S. Chand & Co. Ltd., Ram Nagar, New Delhi.
7. Jordan, E.L. and P.S. Verma, Chordata Zoology and Elements of Animal Physiology, S. Chand & Co. Ltd., Ram Nagar, New Delhi.
8. Nigam, H.C. Zoology of Chordates, Vishal Publishers, Jalandhar 144008.
9. Waterman, Allyn. Jetal, Chordate Structure and Fuction, McMillan & Co. New York.
10. Animal Biology Vol I - Adhikari, Ganguli & Sinha.
11. प्राणी विज्ञान भाग – 1, प्रका  न, म.प्र. हिन्दी ग्रंथ अकादमी, रविन्द्रनाथ टैगोर मार्ग, भोपाल म.प्र.
12. Introduction to Cytology - Veerbala Rastogi.
13. Text Book of Cytology - Dallela & Verma.
14. Laboratory Techniques by Swaroop, Arora & Pathak.
15. Chordate Embryology - Dallela.
16. Cell & Molecular Biology - DeRobertis & DeRobertis.
17. Cell Biology - C.B. Powar.
18. Developmental Biology - Veerbala Rastogi
19. Embryology - M.P. Arora.
20. Chordate Embryology - P.S. Verma.
21.   Embryology - Mundra.

# B. Sc. First Year
## ZOOLOGY

## PRACTICAL WORK

**M.M. : 50**

The Practical work will be based on Theory Syllabus and The Candidates will be required to show a knowledge of the following :-

1. Study of Museum Specimens and Slides relevant to the types studied in theory.
2. Major Dissection :-
   - (a) Cockroach       : Digestive System,Nervous System.
   - (b) Prawn       : Nervous System.
   - (c) Pila       : Nervous System.
   - (d) Teleost Fish       : Nervous System.
3. Minor Dissection :-
   - (a) Hastate plate and Appendages of Prawn.
   - (b) Salivary Glands of Cockroach.
   - (c) Redula of Pila.
4. Mounting (Temporary) :-
   - (a) Mouth part of Insect.
   - (b) Statocyst of Prawn.
   - (c) Ctenidium and Osphradium of Pila.
   - (d) Scales of Teleostean Fish.
   - (e) Mounting Material.
5. Osteology :-
   - (a) Girdles     : Frog, Varanus, Fowl and Rabbit.
   - (b) Skull     : Rabbit and Dog.
6. Study of Different types of Feathers of Birds.
7. Cytology :-
   - (a) Study of DNA and RNA Models.
   - (b) Preparation of Polytene Chromosomes in Chironomous Larva.
   - (c) Squash preparation of Chromosomes from Onion Root tip.
   - (d) Study of Meiosis in Grasshopper testis.
8. Embryology :-
   Study of Different Development Stages of Frog and Chickwhole Mounts and Sections.
9. Field Study Report.
10. Practical Record.

**B. Sc. First Year**
**(Computer Science)**
**Paper- I**
**DIGITAL COMPUTER FUNDAMENTALS**

**Unit - I**

Number system and Information Codes :- Binary, Octal & Hexadecimal number systems, Conversion from one system to another.

**Unit - II**

Boolean algebra and gate network :- Fundamental concepts of Boolean algebra, Logical addition and logical multiplication on gates and OR gates, Complementation and inverters, evaluation on logical expressions, basic laws of Boolean, algebra, De-Morgan's theorem, the principle of duality inter connecting gates, NAND gates and NOR gates, Design using NAND to AND and NOR to OR gate networks.

**Unit - III**

Logical design I :- Flip-Flops, Transfer circuits, Clocks, Gated flip-flop, Master slave flip-flop, JK flip-flop, Shift register, binary counter, BCD counter, Ripple counter.

**Unit - IV**

The memory element :- Primary Storages, Storage locations and addresses storage capacity, RAM (Random access memory), Linear select memory organisation, Decoders, ROM (Read only memory), PROM, EPROM, Cache memory, Registers.

Secondary storage devices :- Sequential and Direct access devices -Punched paper tape, Magnetic Tape, Cartidges, Magnetic disk.

**Unit - V**

Logic design II :- Construction of ALU, Interger representation, Binary Half, Adder, Full adder, addition in the 1's complement and 2's complements systems. Full - adder design, Addition and Subtraction in the 9's complements system.

**Books Recommended :-**
1. Thomas C. Bartee - Digital Computer Fundamentals                           (TMN).
2. P.K. Sinha - Computer Fundamentals (BPB).
3. Malvino & Brown - Digital Computer Electronics (TMN)

# B. Sc. First Year
## (Computer Science)
## Paper- II
## INTRODUCTION TO PROGRAMMING AND PROBLEMSOLVING IN "C")

**Unit - I**

Introduction to high level language, flowcharts, Importance of C, Basic structure of C Program, Characters, keywords, identifiers, Constants, Variables, Datatypes, Declaration of Variables.

**Unit - II**

Operators :- Arithmetic, Relational, Logical, Assignment, Increment, Decrement, Conditional, Special Operators, Precedence of Operators, Expression, Reading & Writing a characters, Input/ Output format, Assignment, If, Nested If, Switch, Else If, Ladder, Operator, Goto, While, Do, For Statements.

**Unit - III**

Array :- One & Two dimensional arrays, Declaring and Initialising string variables, Reading and writing strings from screen, Arithmetic Operations on string.

**Unit - IV**

The "C" functions, General forms, Function argument, Return statement, Returning values, Calling function, No argument, Argument but no return value, Argument with return values.

**Unit - V**

Structure initialisation, Array of structure, Unions, Understanding pointers, Declaring and initialising pointers, Defining and opening a file, input/output Operations on Files, Closing a files.

**Books Recommended :-**
1.    "C" Programming (E. Balaguruswamy).
2.    Programming in "C" (Gottfried).
3.    Let us C (Yaswant Kaneticar).