B.Sc. Final Exam., 2011

Prospectus No.2011123

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

अभ्यासक्रमिका

विज्ञान स्नातक अन्त्य परीक्षा, २०११
(त्रिवर्षीय अभ्यासक्रम)

PROSPECTUS

OF

B.Sc. Final Examination, 2011
(Three Year Degree Course)

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.
Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 138	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba
Amravati University.

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

SYLLABUS FOR

1. MATHEMATICS

(W.E.F. THE SESSION 2005-06)

PAPER-VII
ANALYSIS

Unit-I : **Real Analysis :** Series of arbitary terms, convergence, divergence and oscillation. Abel's and Dirichlet's tests. Multiplication of series. Double series.

Partial derivative and differentiability of real-valued functions of two variables. Schwarz and Young's theorem. Implicit function theorem.

Fourier series. Fourier expansion of piecewise monotonic functions.

Unit-II : Riemann integral. Integrability of continuous and monotonic functions. The fundamental theorem of integral calculus. Mean value theorems of integral calculus.

Improper integrals and their convergence, comparison tests, Abel's and Dirichelet's tests.

Unit-III : **Complex Analysis :** Stereographic projection.

Continuity and differentiability of complex functions. Analytic functions. Cauchy-Riemann equations. Harmonic functions. Elementary functions. Mapping by elementary functions.

Mobius transformations. Fixed points. Cross ratio. Inverse points and critical points. Conformal mappings.

Unit-IV : **Metric Spaces :** Countable and uncountable sets. Definition & examples of metric spaces. Neighbourhoods. Limit points, interior points. Open and closed sets. Closure, interior & boundary points. Sub-space of a metric space. Cauchy sequences. Completeness. Cantor's intersection theorem. Baire Category theorem.

Unit-V : Compactness. Connectedness. Limit of functions. Continuous functions. Uniform continuous functions. Continuity and compactness. Continuity and connectedness.

References :

1. R.R.Goldberg, Methods of Real Analysis, Oxford, IBH publishing Co., New Delhi, 1970.
2. T.M.Karade, J.N.Salunke, K.S.Adhau, M.S.Bendre : Lectures on Analysis; Sonu-Nilu Publication Nagpur.
3. Walter Rudin : Principles of Mathematical Analysis. International students edition (Third Edition)
4. T.M.Apostol, Mathematical Analysis, Narosa Publishing House, New Delhi, 1985.
5. S.Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
6. D.Somasundaram & B.Choudhari, A first Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1997.
7. Shanti Narayan, A Course of Mathematical Analysis, S.Chand & Co. New Delhi.
8. P.K.Jain & S.K.Kaushik, An introduction to Real Analysis, S.Chand & Co. New Delhi, 2000.
9. R.V.Churchill and J.W.Brown, Complex Variables and Applications, 5th Edition, McGraw Hill, New York, 1990.
10. Mark J. Ablowitz & A.S.Fokas, Complex Variables : Introduction and Application, Cambridge University Press, South Asian Edition, 1998.
11. Shanti Narayan, Theory of Functions of a Complex Variable, S.Chand & Co. New Delhi.
12. E.T.Copson, Metric Spaces, Cambridge University Press, 1968.
13. P.K.Jain & K.Ahmed, Metric Spaces, Narosa Publishing House, New Delhi, 1996.
14. G.F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill, 1963.

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PAPER-VIII
ABSTRACT ALGEBRA

Unit-I : **Group-**Automorphisms, inner automorphism. Automorphism groups and their computations. Conjugacy relation. Normaliser. Counting principle and the class equations of a finite group. Center for group of prime-order.

Unit-II : **Ring thoery :** Ring homomorphism. Ideals and Quotient Rings. Field of Quotients of an Integral Domain. Euclidean Rings. Polynomial Rings. Polynomials over the Rational Field. The Eisenstein Criterion.

Unit-III : **Vector Spaces :** Definition and examples of vector spaces. Subspaces. Sum and direct sum of subspaces. Linear span. Linear dependence, independence and their basic properties. Basis. Finite dimensional vector spaces. Existence theorem for bases. Invariance of the number of elements of a basis set. Dimension.

Unit-IV : **Linear Transformations :** Linear transformations and their representation as matrices. The Algebra of linear transformations. The rank nullity theorem. Change of basis. Dual space. Bidual space and natural isomorphism. Adjoint of a linear transformation. Eigenvalues and eigenvectors of a linear transformation.

Unit-V : **Inner Product Spaces :** Inner product spaces - Cauchy-Schwarz inquality. Orthogonal vectors. Orthogonal Complements. Orthonormal sets and bases. Bessel's inequality for finite dimensional spaces. Gram-Schmidt Orthogonalization process. Modules, submodules. Quotient modules. Homomorphism and isomorphism theorems.

References :

1) I.N.Herstein, Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1975.

2) N.Jacobson, Basic Algebra, Vols. I & II W.H.Freeman. 1980 (also published by Hindustan Publishing Company)

3) Shanti Narayan, A Text Book of Modern Abstract Algebra. S.Chand & Co. New Delhi.

4) K.B.Datta, Matrix and Linear Algebra. Prentice Hall of India Pvt.Ltd. new Delhi, 2000.

5) P.B.Bhattacharya, S.K.Jain and S.R.Nagpal,, Basic Abstract Algebra (2nd Edition) Cambridge University Press, Indian Edition, 1997.

6) K.Hoffman and R.Kunze, Linear Algebra, 2nd Edition, Prentice Hall, Englewood Cliffs, New Jersey. 1971.

7) S.K.Jain, A Gunawardena & P.B.Bhattacharya, Basic Linear Algebra with MATLAB, Key College Publishing (Springer-Verlag) 2001.

8) S.Kumaresan. Linear Algebra. A Geometric Approach. Prentice-Hall of India, 2000.

9) Vivek Sahai and Vikas Bist, Algebra, Norosa Publishing House, 1997.

10) I.S.Luther and I.B.S.Passi, Algebra, Vol.-I-Groups, Vol.-II-Rings. Narosa Publishing House (Vol.I-1996, Vol.-II - 1999)

11) D.S.Malik, J.N.Mordeson, and M.K.Sen, Fundamentals of Abstract Algebra, McGraw-Hill International Edition, 1997.

12) T.M.Karade, J.N.Salunke, K.S.Adhau, M.S.Bendre : Lectures on "ABSTRACT ALGEBRA" Sonu-Nilu Publication.2nd Publication.

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PAPER-IX
MATHEMATICAL MODELLING

Unit-I : The Process of applied mathematics. Setting of First-order differential equations - Qualitative Solutions Sketching.

Unit-II : Difference and Differential Equation growth models - single-species population models. Population growth- An age structure model. The spread of Technological innovation.

Unit-III : Higher order linear models - A model for the detection of diabetes. Combat modes. Traffic models - Car-following models. Equillibrium speed distributions.

Unit-IV : Non-linear population growth models. Prey-Predator models. Epidemic growth models. Models from political Science - Proportional representation - cumulative voting, comparison voting.

Unit-V : Applications in Ecological and Environmental subject areas - Urban waste water management planning.

References :

1) Vol.1. Differential equation models, Eds. Martin Braun, C.S.Coleman, D.A.Drew.

2) Vol.2. Political and Related Models. Steven J.Brams, W.F. Lucas, P.D.Straffin (Eds)

3) Vol.3. Discrete and System models.W.F.Lucas, F.S.Roberts, R.M.Thrall.

4) Vol.4. Life Science Models. H.M.Roberts & M.Thompson.

5) All Volumes published as modules in Applied Mathematics, Springer-Verlag, 1982.

OR

PAPER-IX

SPECIAL THEORY OF RELATIVITY

Unit-I : **Review of Newtonian mechanics -** Inertial frames. Speed of light and Galilean relativity. Michelson Morley experiment. Lorentz-Fitzgerold contraction hypothesis. Relative character of space and time. Postulates of special theory of relativity. Lorentz transformation equations and its geometrical interpretation. Group properties of Lorentz transformations.

Unit-II : **Relativistic kinematics -** Composition of parallel velocities. Length contraction. Time dilation. Transformation equations for components of velocity and acceleration of a particle and Lorentz contraction factor.

Unit-III : **Geometrical representation of space-time -** Four dimensional Minkowskian space-time of special relativity. Time-like, light-like and space-like intervals. Null cone, Proper time. World line of a particle. Four vectors and tensors in Minkowskian space-time.

Unit-IV : **Relativistic mechanics -** Variation of mass with velocity. Equivalence of mass and energy. Transformation equations for mass momentum and energy. Energy-momentum four vector. Relativistic force and transformation equations for its components. Relativistic Lagrangian and Hamiltonian. Relativistic equations of motion of a particle. Energy momentum tensor of a continuous material distribution.

Unit-V : **Electromagnetism -** Maxwell's equations in vacuum. Transformation equations for the densities of electric charge and current. Propagation of electric and magnetic field strengths. Transformation equations for electromagnetic four potential vector. Transformation equations for electric and magnetic field strengths. Guage transformation. Lorentz invariance of Maxwell's equations. Maxwell's equations in tensor form. Lorentz force on a charged particle. Energy momentum tensor of an electromagnetic field.

References :

1) C.Moller, The Theory of Relativity, Oxford Clarendon Press, 1952.

2) P.G.Bergman, Introduction to the Theory of Relativity, Prentice Hall of India, Pvt.Ltd., 1969.

3) J.L.Anderson, Principles of Relativity Physics. Academic Press, 1967.

4) W.Rindler, Essential Relativity, Van Nostrand Reinhold Company, 1969.

5) V.A.Ugarov, Special Theory of Relativity, Mir Publishers, 1979.

6) R.Resnick, Introduction to Special Relativity, Wiley Eastern Pvt.Ltd., 1972.

7) J.L.Synge, Relativity; The Special Theory, North-Holland Publishing Company, 1956.

8) W.G.Dixon, Special Relativity : The Foundation of Microscopic Physics, Cambridge University Press, 1982.

9) T.M.Karade, K.S.Adhau & Maya S.Bendre : Lectures on Special Relativity, Sonu-Nilu Publication, Nagpur.

OR

PAPER-IX

DISCRETE MATHEMATICS

Unit-I : Operations, Axioms for a Boolean Algebra, Subalgebra, Partial orders, Boolean expressions and functions, Normal forms, Isomorphisms, Boolean algebra and Propositional calculus. Switching cricuits, simplification of circuits, bridge circuits, logic circuits, lattices.

Unit-II : Graph, Application of graphs, finite and infinite graphs, incidance and degree, isolated vertex, pendant vertex and null graph, isomorphism, subgraphs, walks, path and circuits, connected graphs and components, Euler graphs, operations on graphs, Hamiltonian paths and circuits, the travelling salesman problem.

Unit-III : Trees, some properties of trees, pendant vertices in a tree, distance and centres in a tree, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, cut-sets, some properties of cut-sets. All cut-sets in a graph, fundamental circuits and cut-sets, connectivity and separability, network flows, 1-Isomorphism, 2-Isomorphism.

Unit-IV : Planar graphs, Kuratowski's two graphs, different representations of a planar graph, detection of planarity, vector space associated with a graph, basis vectors of a graph, circuit and Cut-set subspaces, orthogonal vectors and spaces, intersection and join of W_r & W_s.

Unit-V : Incidence matrix, sub-matrices of A(G). Circuit Matrix, Fundamental circuit matrix B and rank of B, an application to a switching network, Cut-set matrix, relationships among A_f, B_f and C_f, Path matrix, adjacency matrix, chromatic number, chromatic partitioning, chromatic polynomial, matchings, coverings, the four color problem.

Text Books :

1) Narsingh Deo : Graph Theory with application to Engineering and Computer Science, Prentice Hall of India New Delhi.

2) Mendelson : "Boolean Algebra and switching circuits", Tata Mcgraw Hill Publ. ColLtd. Asaf Ali Road, New Delhi.

References :

1) Richard Johnson-Baugh : "Discrete Mathematics", published by Macmillan Pub.Co.886, Third Avenue, New York 10022.

2) Olympia Nicodemi : "Discrete Mathematics", C.B.S. Publ. and distributors 485, Jain Bhavan, Bholanath Nagar, Shahadara, Delhi-32 (India)

3) Frank Harary : "Graph theory", Publ. Narosa Publ. House. 307, Shiv Centre d.B.C. Sector Ku Bazar, New Bombay 400 704.

4) Prof.K.R.Parthsarthy : "Basic Graph Theory", By Tata McGraw Hill Publ. Co.Ltd. 4/12, Asaf Ali Road, New Delhi 110002.

5) Gary Chartang Ortrued, R.Odlermann : "Applied and Algorithmic Graph theory", Publisher. Tata McGraw Hill, 4/12 Asaf Ali Road, New Delhi 110002.

6) S.A.Choudum : "A first course in graph theory", McMillan Indian Ltd. Mercantile House, Magazine street, Bombay 10.

7) Goodstein : "Boolean Algebra".

8) E.L.LIU : "Elements of Discrete Mathematics", McGraw Hill Book Co. New York.

9) Seymour Lipschiutz & Marc Lipson : Discrete Mathematics, TMH New Delhi (Schaum Outline series) IInd Edition.

10) John Clark, Derek Allan Halton : A First look at Graph theory, Allied publishers Limited, Mumbai. A-104, Nayapuri, Phase II, New Delhi-110064. First Edn. Reprint 1995.

11) J.N.Salunke : "Boolean Algebera and Graph Theory", Laxmi Publication, Akot.

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2. GEOLOGY

(Effective from the Session 2005-2006)

The examination in Geology at the end of third year shall comprises of three theory papers and a practical examination as follows:

Paper VII	:	Physics and Dynamics of the Earth.
Paper VIII	:	Structural Geology.
Paper IX	:	Environmental Geology, Hydrogeology, Remote Sensing, and Mineral Exploration.

Practical.

Each theory paper will be of three hour duration and carry 40 marks. Practical examination will be of three hour duration and carry 30 marks. The distribution of marks for practical will be as follows :

A]	a)	Aerial Photol Satellite imagers interpretation	:	4 Marks.
	b)	Morphometrics Analysis	:	3 Marks
	c)	Structural Geology problems	:	3 Marks
	d)	Section drawing	:	4 Marks
	e)	Hydrogeology Problems	:	3 Marks
	f)	Exploration Problems	:	3 Marks
B)	Sessional + Practical record		:	2 Marks
C)	a) *Co-curricular Activity Report		:	3 Marks
	b) Field Work		:	3 Marks
	c) Viva		:	2 Marks
		Total	:	30 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

The following syllabus is prescribed on the basis of two lectures per paper i.e. six lectures per week for three papers and six practical periods per batch per week (i. e. two practical of three periods per batch). Candidate must pass separately in practical and in total of theory papers.

Paper VIII
Physics and Dynamics of the Earth.

UNIT-I : Interior of the Earth : internal structure and chemical composition of various layers, Geochemical evolution of earth. Geophysical Conditions of the Earth: gravity, Magnetism and heat flow.

UNIT-II : Application of geophysics in understanding dynamics of earth. Concept and theories of isostacy. Definition, classfication, and evolution of Geosynclines. Earth movement through time: orogenic and epiorogenic movements.

UNIT-III : Concept of Continental drift, Evidence of continental drift, Causes of drift. Limitations of drift. Evidence of Sea floor spreading and Palaeopagnetism.

UNIT-IV : Evolution of Plate Tectonics theory, Nature and types of plate margins, geometry and causes of plate motion. Origin and significance of mid-oceanic ridges and trenches. Origin and distribution of Island arcs.

UNIT-V : Neo tectonics: active faults, geomorpholigical indicators, drainage changes, recurrent seismicity.

Paper VIII
Structural Geology

UNIT-I : Study of outcrops, outcrop in relation to topography and sturucture, Overlap (off lap and onlap) Erosional Strucutres Inlier and outlier, Klippe and genster, synclinal hill and anticlinal valley. Unconformities: Kinds, geological significance and their recognition.

UNIT-II : Concept of rock deformation. Types of forces, stress and strain, Stress, strain in material, inter relationship of stress, strain and time. Determination of strain in rocks by using initial spherical objects. Deformed conglomerate & bilateral symmetrical fossils.

UNIT-III : Fold morphology, geometric and genetic classifications. Mechanics and causes of folding. Joints- geometric and genetic classification of joints.

UNIT-IV : Faults- Geometric and genetic classification of faults. Effects of faulting on the outcrops. recognition of faults in field. shear zones: types, geometry and kinematics of shear zone.

UNIT-V : Foliation: descriptive terminology, kinds, origin and relation to major structures. Lineation: descriptive terminology, kinds and origin, relation to major structures. Map symbols for the above structural features.

Paper IX
Environmental Geology, Hydrogeology, Remote Sensing and Mineral Exploration.

UNIT-I : Concept and definition of Environmental Geology, Brief idea about Natural hazards like earthquakes, landslides,floods, volcanic activity, costal erosion and desertification and their impact on environment.

UNIT-II : Concepts of natural ecosystems on the Earth and their mutual interelations and interactions (Atmosphere, Hydrosphere, lithosphere an Biosphere). Environmental changes due to human-dominated environment over nature-dominated system. Environmental considerations in the location and construction of large dams, reservoirs and tunnels.

UNIT-III : Hydrologic cycle, Occurrence and distribution of groundwater, Water table, cone of depression and recharge, Influent and affluent seepages. Groundwater reservoirs and their classification, classification of aquifers. Darcy's law and its validity. Groundwater provinces of India. Concept of watershed management.

UNIT-IV : Introduction to aerial photographs, satellite imageries. Types of Aerial photos, Method of studying aerial photos in the form of Mossac and stereo pairs. Pocket and mirror stereoscope. Recognition of photo elements- tone, texture, pattern, shape, size , form etc. Photographic expressions of various geological features on aerial photographs. Guidelines for lithological, structural, and geomorphic interpretation.

UNIT-V : Mineral Exploration: Surface and subsurface exploration methods including use of remote sensing techniques. Prospecting for mieraLS: drilling, sampling and assaying. Brief idea about Gravity, sismic electrical, magnetic and airborne methods of exploration. Elementary ideas about geo-botanical and geo-chemical methods of exploration.

Practical :

1. Morphometric analysis from topographical maps. Introduction to geo-logical interpretations of remote sensing data. Photo-geological study of aerial photographs.
2. Exercises on structural geology problems. Geometrical problems on folds

and faults. drawing and the interpretation of profile sections across the geological maps.

3. Preparation and interpretation of water table maps.
4. Laboratory exercises in solving exploration related problems.

Geological Field Training :

Every students should attend a field work for a minimum of one week and submit field diary, geological specimens and report.

Books Recommended for B.Sc. - III :

Structural Geology :

1. Bilings, M.P. (1997) Structural Geology. Prentice-Hall of India Pvt.Ltd., New Delhi.
2. Hills, E.S.(1972) Outline of Structural Geology.
3. Hobbs, B.E., Means, W.D.and Williams, P.F.(1986) Outline of Structural Geology. John willey and Sons Inc., New York.
4. Suppe, J. (1985) Principles of Structural Geology. Pretice-Hall, New Jersey.
5. Park, R.G. (1989) Foundations of Structural Geology. Blackie, New York.
6. Gokhale, N.W.(2001) Theory of Structural Geology. Blackie, New York.
7. Gokhale, N.W.(1991) A Manual of Problesms of Structural Geology. CBS Publishers.
8. Mathur, S.M. (2001) Guide to Field Geology, Prentice-Hall, New York.
9. Compton, R.R. (1962) Manual of Field Geology, CBS Publishers.
10. Lahi, F.H. (1987) Field Geology, CBS Publishers.
11. Gokhale, N.W. (2001) A Guide to Field Geology. CBS Publishers.
12. Butler, B.C.M. & Bell, J.D. (1988) Interpretation of Geological Maps, Longman Scientific and Technical , Harlow, Essex.
13. Philips, F.C.(1971) The use of Stereographic Projection in Structural Geology, Edward Arnold, London.
14. Roberts, J.L. (1982) Introduction to Geological Maps and Structures, Pergamon, Oxford.
15. Ragan, D.M. (1973) Structural Geology: an Introduction to Geometrical Techniques (2nd edition), Wiley, New York.
16. Bolton, T. (1989) Geological Maps: Their Solution and Interpretation. Cambridge University Press.

Environmental Geology:

1. Valdiya, K.S.(1987) Environmental Geology - Indian Context, Tata McGraw Hill .
2. Miller, J.R. (2002) Sustaining the Earth. Brooks/Cole Thomson Learning Inc.

3. Foley, Duncan, McKenzie, G.D. and Utgard, R.O. (1999) Investigations in Environmental Geology. Prentice-Hall, New Jersey.
4. Keller, E.A.(1978) Environmetnal Geology. Bell and Howell, USA.
5. Bell, F.G.(1999) Geological Hazards, Routledge, London.
6. Coats, D.R. (1981) Environmental Geology. Joh Wiley & Sons, New York.

Mineral Exploration :

1. McKinstry, H.E. (1972) Mining Geology. Pretice- Hall Inc.
2. Arogyaswamy, R.N.P. (1995) Courses in Mining Geology. Oxford and IBH Publishing Co., New Delhi.
3. Bagchi, T.C., Sen Gupta, D.K. and Rao, S.V.L.N. (1979) Elements of Prospecting and Exploration. Kalyani Publishers, New Delhi.
4. Dobrin, M.B.(1952) Introduction to Geophysical Prospecting. McGraw Hill.
5. Howel, B.F.(1959) Introduction to Geophysical Prospecting. McGraw Hill.
6. Lowrie, W. (1997) Fundamentals of geophysics. Cambridge University Press.
7. Mussett, A.E.and Khan, M.A.(2000) Looking into the Earth: An Introduction to Geological Geophysics. Cambridge University Press.

Remote Sensing :

1. Pande, S.N.(1987) Principles and Applications of Photogeology . Wiley Eastern Limited.
2. Sabisn, F.F. (2000) Remote Sensing Principles and Interpretations. W.H.Freeman and Company, USA.
3. Lilesand, T.M.and Kiefer, R.W.(2000) Remote Sensing and Image Interpretation. John Wiley and Sons Inc., New York.
4. Drury, S.A.(1997) Image Interpretaton in Geology. Chapman and Hall, London.

Hydrogeology :

1. Todd, D.K.(1980) Ground Water Hydrology. John Wiley and Sons Inc. New York.
2. Karanth, K.R.(1989) Hydrogeology. Tata McGraw Hill Pub.Co.Ltd., New Delhi.
3. Nagabhushaniah, H.S. (2001) Groundwater in Hydrosphere (Groundwater Hydrology) CBS Publisher, New Delhi.
4. Karanth K.R.Groundwater, Assessment, Development and Management. Tata McGraw Hill Pub. Co. Ltd., New Delhi.

LIST OF EQUIPMENTS & MATERIALS FOR B.SC. (GEOLOGY)

Petrology Practicals :-

1. A set of 200, Rocks specimens for megasocopic study (set should include all the types of rocks). As listed in practicals and their varieties.
2. A set of 100 rock slides for Microscopic study (Set should include all slides of all the rocks listed in practicals and their varieties.
3. A set of 50 rocks slides showing typical textures of Igenous, Sedimentary and Metamorphic rocks.

Mineralogy Practicals :

1. A Set of 200 Rock forming Minerals specimen for Magascopic study. (Set should include all the minerals as listed in syllabus and their varieties).
2. A Set of 100 Minerals slides (thin sections) for microscope study. (Set should include all the minerals listed in practical and the scheme in different directions.
3. A set of 25 Oriented Minerals slides to demonstrate axiallity, optic sign, pleochrosim shceme Extinction etc.
4. Minerals sets demonstrating Hardness, Cleavage, Lusture, Streak and forms etc.

Ore Minerals.

A set of 100 one Minerals for Megascope study. (Set should be made with one Minerals as listed in Practical an included in Indian Matallic deposit of Theory course).

A Part from this geological material following equipments are essential for Megascopic and Microscopic study.

1.	Petrological Slide, Projector (For Demonstration of this section) with screen	1.No.
2.	Magnifiers 10x or more (Table/Hand model with large view for Magascopic Study)	20 Nos.
3.	Hand lens 10 x or 20 x	20Nos.
4.	Streak Plates	20 Nos.
5.	Perrological ploarizing miscroscope	20 Nos.

6.	Minocular microscope with point counter, Camera Lucida and U. Stage fitting.	1 Nos.

CRYSTALLOGRAPHY

1. A set of 150 wooden crystallography models belonging Normal class of six major crystal system.
2. A set of 25 wooden models showing twnning and the type and laws.
3. Contact Goniometer
4. Set of transparant, Crystal models demonstrating Laxes planes and centre of symmetry of different Normal class of major system.
5. A set of atomic structure models demonstrating basic types.

Palaeontology

1. A set of 100 fossil as included in the practical syllabus and the phyllum mentioned in theory course.
2. A set of 20 plant fossils as mentioned in practical course and their varieties.
3. A set of 25 Geomorphological models.
4. Index map of Survey of India.

GEOMORPHOLOGY

1. Toposheet of survey of India on 1:50.000 scale covering Entire Vidarbha.
2. Degree sheets of survey of India on 1.25,000 scal covering entire Vidarbha.
3. Rotarameter 5 Nos.
4. Planimeter 5 Nos.
5. Tracing table (large size) 1 Nos.

PHOTOGEOLOGY

1. Lens Steroscope 10 Nos.
2. Mirror Stereoscope 10 Nos.
3. Aerial Photographs (Stereopairs) 10 Nos.

a) A set of 10, demonstrating different types of Lithologies, Structure etc.

b) Aerial photographs and Land sat imageries covering Vidarbha for geological & Geomorphological and ground water studies.

4. A set of about 50 Structural models demonstrating various types of Primary and Secondary geological structure.

STRUCTURAL GEOLOGY

A) Every department should have adequate copies of outcrop maps and geological maps, so as to cover different geological situation from simplest to comples.

STRIGRAPHY

1. Large scale geological map of India.
2. Geological maps of various states or Geological sheet atlas of India.
3. Tectonic map of India.
4. Geological map of various geological systems and the type area.

Charts

As for as possible maximum no of charts should be present for demonstration of symmetry elements, crstallographic system. Morphology of various phyllum, structural diagram, geodynamics, gelogical works performed by natural agencies. Mineralogical, pertrological and optical variation in rocks and minerals etc. Minimum 100 charts of basic data should be available.

Field Work.

1. Geological Harmmer 100 gm.	10 Nos.
2. Harver Sack	20 Nos.
3. Field camera (Pantax) with zoomlens and flash guns	1 Nos.
4. Water bottle	2 Nos.
5. Steel tapes 5 Mtr., 10 & 50 Metrs.	2 Nos. Each.
6. Clinometer campass	12 Nos.
7. Bruten campass	5 Nos.

In addition of these following additional equipments if kept will help to improve teaching and practical demonstration techniques related to course.

1. Overhead Projector	1 Nos.
2. Epidioscope	1 Nos.
3. Any geophysical instrument Resistivity/Seismic	1 Nos.
4. Water analysis kit	1 Nos.
5. Computer with recent configuration (Minimum P-IV)	1 Nos.

(Note: 1) Necessary arrangement should be made available to display these models so that students can observe them as and when they like, Adequate no. of trays, showcases should be made available.

2) As far as possible Geological Musium should be separate.

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3. STATISTICS

(IMPLEMENTED FROM THE SESSION 2005-06)

The examination in Statistics will comprise of two theory papers and a practical examination. Each theory paper will be of three hours duration and carry 60 marks. The practical examination will be of three hours duration and carry 30 marks. The distribution of marks for practical will be as follows :

1)	Practical Record	04 Marks
2)	Viva voce	05 Marks
3)	Practical Problem	18 Marks
4)	*Co-curricular Activity Report	03 Marks
		Total : 30 marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

The following syllabus is prescribed on the basis of three lectures per week per paper and 6 practical periods per batch per week. Each theory paper has been divided into 5 units. There shall be one question on every unit with internal choice for each. Out of five questions three shall be of the short answer type and two shall be of long answer type. Each short answer type question should contain three to four questions each carrying not more than four marks. Long answer type questions should consist of questions each carrying more than four marks.

The colleges imparting instructions in Statistics should provide a 12 digit desk model electronic calculator to every student for the practical work. The calculator should not have any trignometric, exponential, logarithmic or statistical function.

PAPER-V
STATISTICAL QUALITY CONTROL AND COMPUTATIONAL TECHNIQUES

UNIT-I : Statistical Quality Control : Importance of statistical methods in industrial research and practice, specification of items and

lot qualities corresponding to visual guaging, count and measurements, types of inspection, determination of tolerance limits. General theory of control charts, causes of variation in quality, control limits, subgrouping, summary of out of control criteria.
Control charts for attributes - np-chart, p-chart, c-chart.

UNIT-II : **Acceptance Sampling Plan :** Control charts for variables - X and R charts.
Problem of lot acceptance, stipulation of good and bad lots, producer's and consumer's risks, single and double sampling plans, their OC functions, concepts of AQL, LTPD, AOQL, average amount of inspection and ASN function.

UNIT-III : **Computational Techniques :** Difference and shift operators, difference tables and methods of interpolation, Newton's and Lagrange's methods of interpolation, divided differences, numerical differentiation and integration, Trapezoidal rule, Simpson's one-third and three-eighth rule, iterative solution of non-linear equations.

UNIT-IV : **Linear Programming :** Elementary theory of convex sets, definition of general LPP, formulation of LPP, examples of LPP, problems occuring in various fields, graphical and simplex method of solving LPP, artificial variables.

UNIT-V : Duality of LPP. Transportation problem (non-degenerate and balanced cases only), various methods to find initial basic feasible solution. Assignment problem. Sequencing problem - n jobs with 2-machines.

References :

1) Brownlee K.A. (1960) : Statistical Theory and Methodology in Science and Engineering, John Wiley and Sons.
2) Grant E.L. (1964) : Statistical Quality Control, Mc Graw Hill.
3) Duncan A.J. (1974) : Quality Control and Industrial Statistics, Taraporewala and Sons.
4) Gass S.I. (1975) : Linear Programming Methods and Applications, Mc Graw Hill.
5) Rajaraman, V. (1981) : Computer Oriented Numerical Methods, Prentice Hall.
6) Sastry S.S. (1987) : Introductory Methods of Numerical Analysis, Prentice Hall.

7) Taha H.A. (1989) : Operations Research : An Introduction, Macmillan Publishing Company.
8) Kantiswaroop, Manmohan, Gupta : Operations Research.
9) Goyal and Mittal : Operations Research.
10) Gupta S.C. and Kapoor V.K. : Fundamentals of Mathematical Statistics, Sultan Chand.
11) Saxena H.C. : Finite differences.

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PAPER-VI
SAMPLE SURVEYS, ANALYSIS AND DESIGN OF EXPERIMENTS

UNIT-I : **Sample Surveys :** Sample surveys, concept of population and sample, need for sampling, census and sample survey, basic concepts in sampling, sampling unit, sampling frame. Sampling errors and non-sampling errors, organisational aspects of survey sampling, sample selection and sample size, preparation of questionnaire and working of NSSO.
Some basic sampling methods : Detailed study of simple random sampling with and without replacement.

UNIT-II : **Stratified Random Sampling :** Stratified random sampling with various allocations and their comparison, comparison with SRS, estimation of gain in precision due to stratification.
Systematic Sampling : Estimation of population mean and variance, comparison of systematic sampling with stratified and SRS for a population with linear trend.

UNIT-III : **Analysis of Variance :** Introduction to ANOVA, one way classification, two way classification with one observation per cell, two way classification with multiple but equal number of entries per cell.

UNIT-IV : **Design of Experiments :** Introduction to Design of Experiments, need for design of experiments, fundamental principles of design of experiments, uniformity trials, shape and size of plots and blocks. Analysis of Completely Randomised Design, analysis of Randomised Block Design, comparison of CRD with RBD in terms of efficiency.

UNIT-V : **Latin Square Design and Factorial Experiments :** Analysis of LSD, efficiency of LSD as compared with CRD and RBD.
Factorial Experiments : Its purpose, need and advantage. Analysis of 2^2 and 2^3 factorial experiments, computation of main effects and interaction effects, Yate's method (upto three factors).

References :

1) Cochran W.G. and Cox G.M. (1957) : Experimental Designs, John Wiley and Sons.
2) Das M.N. and Giri (1986) : Design and Analysis of Experiments, Springer Verlag.
3) Murthy M.N. (1967) : Sampling Theory and Methods, Statistical Publishing Society, Calcutta.
4) Sampath S., (2000) : Sampling Theory and Methods, Norasa Publishing House.
5) Sukhatme B.V. (1984) : Sample Survey Methods and its Applications, Indian Society of Agricultural Statistics.
6) Des Raj (2000) : Sample Survey Theory, Narosa Publishing House.
7) Goon A.N., Gupta M.K., Das Gupta B. (1986) : Fundamentals of Statistics, Vol.-II, World Press, Calcutta.
8) Kempthorne O. (1965) : The Design and Analysis of Experiments, Wiley Eastern.
9) Singh D. and Chaudhari F.S. : Theory and Analysis of Sample Survey Designs.
10) Clark : Statistics and Experimental Designs.
11) Parimal Mukhopadhaya : Theory and Methods of Survey Sampling, Prentice Hall.
12) Sukhatme P.V., Sukhatme B.V. : Sampling Theory of Surveys with Applications.

List of Practicals :

1) Construction of control chart for attributes.
2) Construction of control chart for variables.
3) Drawing of OC curve for single sampling plan.
4) Drawing of OC curve for double sampling plan.
5) Drawing of AOQ and ASN curves.
6) Construction of difference tables.
7) Problem's on Newton's and Lagrange's method interpolation and divided difference formulae.
8) Problems on numerical evaluation of integrals using Trapezoidal Rule.
9) Problems on numerical evaluation of integrals using Simpson's one third and Simpson's three eighth rule.
10) Iterative solution of non-linear equations by Newton-Raphson method.
11) Formulation of L.P.P.
12) Solution of L.P.P. by Graphical Method.
13) Solution of L.P.P. by Simplex Method.

14) Problems on duality.
15) Computation of initial basic feasible solution to transportation problem by various methods.
16) Assignment Problem.
17) Sequencing Problem - n jobs with 2-machines.
18) Estimation of population mean and variance using SRS.
19) Estimation of population mean and variance using different allocations in stratified random sampling.
20) Estimation of gain in precision due to stratification.
21) Determination of sample size in stratified sampling.
22) Estimation of population mean and variance in systematic sampling.
23) Comparison of systematic sampling with stratified and SRS for population with linear trend.
24) ANOVA : One way - classification.
25) ANOVA : Two-way classification with one entry per cell.
26) ANOVA : Two-way classification with multiple but equal no. of entries per cell.
27) Analysis of Completely Randomised Design.
28) Analysis of Randomised Block Design.
29) Analysis of Latin Square Design.
30) Analysis of 2^2 - Factorial Experiment arranged in R.B.D.
31) Analysis of 2^3 - Factorial Experiment arranged in R.B.D.

List of Equipments and instruments required for a batch of students in the under graduate statistics laboratory.:

1)	Twelve digits desk model electronics calculator	- 25
2)	Biometrica tables Vol.-I and Vol.-II	- 05 each
3)	Seven figure logarithmic tables	- 10
4)	Statistical Tables (Compiled)	- 10
5)	Random number tables	- 10
6)	A mathematical typewriter	- 01
7)	A duplicating machine	- 01
8)	Personal Computer	- 05
9)	Printer	- 01
10)	Statistical postures and charts	- 01

11) Software packages, like ststat, stat lab., SPSS/OR other useful packages may be provided in laboratory for practical purpose.

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4. GEOGRAPHY

The Examination in Geography will comprise two Papers and one Practical. Theory Papers shall be of three hour's duration and shall carry 60 marks each. The practical Examination shall be of four hour's duration and shall carry 30 marks.

The following syllabus is prescribed on the basis of 3 lectures per paper per week two practicals of three periods each.

PAPER-V
ECONOMIC AND HUMAN GEOGRAPHY
SECTION-A
ECONOMIC GEOGRAPHY

Unit-I :
1. Definition, meaning and scope of Economic Geography. A Dynamic subject Development of new branches.
2. Classification of occupations:Primary, Secondary and Tertiary occupation. Their characteristics.
3. Fishing: Inland coastal and open sea fisheries substance and commercial fisheries.
4. Lumbering study of tropical and temperature forests Exploitation of forests:forest products.

Unit-II :
1. World Agriculture types: Tropical subsistence agriculture. Monsoon Agriculture, Plantation Agriculture, Mediterranean Agriculture, mixed farming and Dairy Farming Characteristics and production of important crops.
2. Power Resources:Coal, Petroleum and hydroelectricity;capacity of power resources and the exploitation of new possibilities.

Unit-III :
1. World Industries:Locational factors involved, study of Iron and Steel Industry and Aluminium Industry, Textile and Sugar Industry.
2. World Transportation:Distribution and density of world transport routes, Major trade routes of the world.

SECTION-B
HUMAN GEOGRAPHY

Unit-IV :
1. Definition and scope of Human Geography.

2. The Study of natural environment factors of natural environment :Influence of relief, climate, minerals and water bodies on human life.
3. Change in the natural environment. Natural agencies bringing change. Human agencies bringing change.

Unit-V : The concept of cultural landscape Exploitation of the natural environment and the resultant cultural landscape. Cultural landscape of agriculture industry and mining.

Unit-VI : Human settlements : Urban and Rural Factors affecting the location and growth urban centres. Rural settlement types-linear, nodal, ring types.

Note : There will be one question on each unit. Each question will have an alternate choice.

PAPER-VI
THREE SOUTHERN CONTINENTS

Study of South America, Africa and Australia under the following heads:

Unit-I :
1. Geographical position, Structural build.
2. Relife and drainage.

Unit-II :
1. Weather conditions, climate and climate regions.
2. Soils.
3. Begetation.

Unit-III : Agriculture

Unit-IV : Mineral and power resources.

Unit-V : Industries

Unit-VI :
1. Transportation.
2. Population.

Note : There will be one question on each unit. Each question will have an alternate choice. There will be Two questions on each continents.

PRACTICAL:

1. Construction of Statistical maps and diagrams.

   (A) Bar graph (B) Compound bar graph (C) Divided circle (D) Proportional circles (E) Spheres.
2. Distribution and density maps:Dot, Shading and isopleth methods.
3. Measures of central tendencies-mean, mode and median. Measures of dispersion:Quartiles, mean deviation and standard deviation.

4. Survey by Plane Table-(a) Radiation method. (b) Intersection method (c) Resection method.
5. Preparation and interpretation of village landuse map on the basis of a field study.

NOTE: As per decision of academic council in its meeting held on 16-1-1990, maximum number of examinees in Geography practical examinations up to B.A./B.Sc. level shall not exceed 40 examinees per day vulgaris, Tests:

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION

1.	Statistical Maps & Diagrams	5 Marks
2.	Distribution of Density maps	5 Marks
3.	Statistical methods	5 Marks
4.	Surveying	5 Marks
5.	Field Study	5 Marks
6.	Practical records and Viva-Voce	5 Marks
	Total	: 30 Marks

BOOKS RECOMMENDED:

1. Alexander John:Economic Geography.
2. Jones C.F. & Darkenwold G.G.: Economic Geography.
3. Guha J.L. & Chattoraj P.R. : A New Approach to Economic Geography (A study of Resources) The World press Pvt. Ltd.
4. Russell Smith: Industrial and Commercial Geography. Holt Rinehort, New York.
5. Shaw E.B.:World Economics Geography, John Willey.
6. Van Royen & Bengston:Fundamentals of Economic Geography Prentice Hall, New Delhi.

HUMAN GEOGRAPHY

1. Money D.C. : Introduction to Human Geography, University Tutorial, Press London.
2. Davis D.H. : The Earth and Man.
3. James Preston:A Geography of Man, Blaisdell Publication Co.
4. White and Renner:College geography.
5. Hintington.E.:Principles of Human Geography, John Willey.
6. R.L.Singh:Elements of Practical Geography.

7. Singh R.N.:Map work and Practical Geography.
8. Mark House & Wilkinson:Map and diagrams.

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5. MICROBIOLOGY

(Implemented from the Session 2005-06)

The Examination in Microbiology shall comprise of two theory papers and one practical. Each theory paper is divided into five units. There shall be one question from each unit with internal choice. Examinee shall attempt all five questions. Theory paper shall be of three hours duration and carry 60 marks each. Practical examination (each batch of 16 students) will last for at least two consecutive days with minimum four working hours each day. The syllabus is based on six theory periods and six practicals per week.

PAPER-V

ENVIRONMENTAL MICROBIOLOGY AND BIOINSTRUMENTATION

Unit-I Microbial Associations and Air Microbiology

A Microbial Associations : Definition and examples of positive (Mutualism, Commensalism, Synergism), negative (Antagonism, Competition, Parasitism) and neutral association.

B Air Microbiology
- a) The atmosphere and its layers.
- b) Different types of microorganisms in air.
- c) Techniques for microbiological analysis of air :
  - i) Solid impingement devices
  - ii) Liquid impingement devices.
- d) Airborne diseases : Etiology, symptoms and prevention.
- e) Control of microorganisms in air.

Unit-II Microbiology of Soil.

- a) Microorganisms in soil.
- b) Rhizosphere.
- c) Decomposition of plant and animal residues in soil.
- d) Definition, formation, function and microbiology of humus and compost.
- e) Biological nitrogen fixation : Types of nitrogen fixing microorganisms, factors affecting and mechanism of symbiotic and non-symbiotic nitrogen fixation. Process of nodulation, nitrogenase complex, recombinant DNA and nitrogen fixation, legume inoculants.

f) Cycles of elements in nature :
   i) Carbon cycle : CO_2 fixation, organic carbon degradation.
   ii) Nitrogen cycle : Proteolysis, amino acid degradation, Nitrification, Denitrification, Degradation of nucleic acids.
   iii) Sulphur cycle
   iv) Phosphorus cycle.
   v) Biofertilizers, biological pest control.

Unit III A) Water Microbiology

a) Planktons : Definition, types, factors affecting growth of planktons, methods of enumeration, beneficial and harmful activities of planktons.
b) Control of plankton problems
c) Eutrophication and its control.

B) Assessment of Water Quality and Treatment

Bacteriological analysis of water:
i) Significance of bacteriological analysis of water.
ii) Collection and handling of water sample from various sources.
iii) Indicators of excretal pollution.
iv) Multiple tube dilution technique, MPN.
v) IMViC classification of coliform.
vi) Membrane filter technique for coliform and faecal Streptococci.
vii) ICMR and WHO Bacteriological standards of drinking water.

Unit 1V A) Water Treatment

a) Self purification of water : Various zones and factors responsible for self purification.
b) Treatment of water : Aeration, Coagulation, Flocculation, Sedimentation and Filtration.
c) Slow and Rapid sand filters : Construction, mechanism of filtration, differences.
d) Methods of chlorination : Plain, super chlorination, ammonia-chlorine treatment, Break-point chlorination

B) Waste Water Treatment

a) Aims of sewage treatment, composition of sewage.
b) Muncipal sewage treatment plant.
c) Preliminary treatment (seiving and Grit chamber)
d) Primary treatment(sedimentation)

e) Secondary treatment (Aerobic)
   i) Trickling filter
   ii) Activated sludge process
   iii) Oxidation pond
f) Anaerobic sludge digestion
g) Domestic sewage treatment by septic tank and Imhoff tank.
h) Concept of COD,BOD.
i) Outline of bio-gas production

Unit V Bio-Instrumentation

a) Spectroscopy- Definition, Principle, types (UV&IR) & its applications.
b) Electrophoresis- Definition, Principle, types (Paper&Gel) & its applications.
c) Chromatography- Definition, Principle, types (Paper&TLC) & its applications.
d) Isotopic Tracer Techniques- Definition, Principle & applications.

Paper- VI
INDUSTRIAL FERMENTATION, FOOD MICROBIOLOGY AND METABOLISM

Unit- I Fermentation in General.

a) Definition and scope of Industrial microbiology and bio-technology.
b) Important classes of industrial microorganisms.
c) Fermentation :- Definition and types (batch and continuous, aerobic and anaerobic, surface and submerged fermentations)
d) Production strains
e) Screening :- Definition, Primary screening (crowded plate technique, auxonography, enrichment culture technique, use of indicator dyes), secondary screening.
f) Scale up process :- Definition and significance.
g) Inoculum buildup : Spore and vegetative inoculum.
h) General layout of fermentation plant :- Fermentation equipment and its uses.
i) Raw materials :- Composition and uses. Saccharine, starchy,

cellulose raw materials, hydrocarbon and vegetable oils, nitrogenous material (corn steep liquor).

j) Antifoam agents.

k) Sterilization of media :- Batch and continous sterilization.

l) Detection and assay of fermentation products.

Unit- II Industrial Productions.: Microorganisms, raw material, inoculum buildup, fermentation conditions, recovery, uses and mechanism of the following products.

a) Ethyl-alcohol : From molasses and waste sulphite liquor.

b) Beer.

c) Wine (Red table and White table).

d) Acetone- Butanol from corn.

e) Baker's yeast : From molasses, Definition of compressed and active dry yeast.

f) Single cell protein : From bacteria, yeast and algae.

g) penicillin.

h) Vinegar (Orlean's process and Fring's generator).

i) Amylase : Bacterial and fungal.

Unit-III Microbiology of Milk

a) Definition

b) Composition and types of milk.

c) Sources of microorganisms in Milk.

d) Types of microorganisms in milk.

e) Pasteurization of milk : LHT, HTST, UHT. Phosphatase test.

f) Grades of milk.

g) Concentrated milk and milk powder.

h) Preparation of fermented milk products, butter and cheese.

Unit-IV Food Microbiology

a) Sources of contamination of fresh food.

b) Microbial spoilage of foods.

c) Preservation of foods :- Low and high temperature, dehydration, high osmotic pressure, chemical preservation, radiations and canning.

d) Fermented foods : Idli, pickles and sauerkraut.

e) Food poisoning : Food infection and food intoxication.

Unit-V Enzymology and Metabolism

A Enzymology :

a) Nature and Definition.

b) Classification and nomenclature of enzymes.

c) Terminologies used in enzymology :- Enzyme, active site, substrate, co-enzyme, co-factor, prosthetic group, holoenzyme, apoenzyme, activation energy, isoenzyme, allosteric enzyme, inhibitors, immobilised enzymes.

B Metabolism :

a) General strategies of metabolism.

b) EMP pathway, TCA cycle.

c) Oxidative phosphorylation and Electron transport chain.

d) Beta-Oxidation.

e) General concept of Respiration and Fermentation.

PRACTICALS :

1. A) Microbiological Examination of milk.

   a) Plate Count, b)Methelyne blue reduction Test. c) Phosphatase test d) Test for coliform bacteria. e) Estimation of fat in milk.

   B) Demonstration of microbes in Curd.

2. Bacteriological analysis of water and Waste Water.

   a) Standard plate Count.

   b) Multiple tube dilution technique (MPN for Coliform)
   i) Presumptive test ii) Confirmatory test iii) Completed test.

   c) IMViC test for coliform

   d) Multiple tube dilution technique for faecal strepto cocci.

   e) Membrane filter technique for coliforms & faecal streptococci.

   f) BOD estimation.

   g) Isolation of Bacteriophage from Sewage.

   h) Determination of Chlorine demand and residual chlorine.

3. A) Laboratory Scale production, recovery & Quantitative estimation of following Products.
   a) Ethyl alcohol. b) Citric Acid c) Amylase

   B) Immobilisation of Yeast.

4. Microbiological Examination of egg, Vegetables, fruits and Canned Foods by

   a) Plate Count b) Test for Coliform bacteria. c) Yeast & Molds.

5. a) Enumaration of Soil micro-organisms.

   b) Isolation of *Azotobacter* & *Rhizobium* from Soil.

6. Milk testing for Adulteration.
7. Effect of Ultra-violet/Filtration on micro-organism present in water.
8. Separation of amino acids and sugars by paper chromatography.
9. Educational tour (Every student shall attend the Excursion and shall submit a report of field studies).

Distribution of Marks For Annual Practical Examination

1.	Phosphatase/Methylene blue reduction test Curd microbiology/Estimation of fat in milk.	....	03
2.	MPN/IMViC/BOD/MFT/Standard test for coliform	....	03
3.	SPC of Milk/Foods/Fruits/Canned food	....	05
4.	Estimation of Alcohol/Citric Acid/Isolation of *Azotobacter/Rhizobium*/Paper Chromatography	....	05
5.	Spotting	....	05
6.	Viva	....	04
7.	*Co-curricular activity report	....	03
8.	Class record	....	02
		Total Marks:	30

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

BOOKS RECOMMENDED FOR PAPER-V

1.	Introduction to Soil Microbiology	:	Alexander Martin
2.	Soil Microbiology	:	Subbaroa N.S.
3.	Introduction to environmental Microbiology	:	Mitchell, Ralph
4.	Sewage & Waste treatment	:	Hammer
5.	Water Pollution	:	Zajic J.E.
6.	Water Pollution Microbiology	:	Mitchell R.
7.	Air Pollution	:	Perlins H.L.
8.	Aquatic Microbiology	:	Stainner & Shewan
9.	Introduction to Waste Water Treatment processes	:	Ramalhr R.S.

BOOKS RECOMMENDED FOR PAPER-VI

1.	Food Microbiology	:	Fazier W.C. & Westhoff D.C.
2.	Fermented Foods (Vol.7)	:	Rose A.A.
3.	Industrial Microbiology	:	Prescott S.C. & Dunn C.G.
4.	Industrial Microbiology	:	Miller B.M. & W. Litsky
5.	Industrial Microbiology	:	A.H. Patel
6.	Microbial Technology	:	Pepller H.J. (Vol. I & II)
7.	Industrial Microbiology	:	Casida L.E.
8.	Principles of Fermentation Technology Allan.	:	Stanbury, Peter F. & Whitaker
9.	Outlines of Diary Bacteriology	:	Sukumar De
10.	Modern Food Microbiology	:	Jay, Mames M.
11.	Principles of Industrial Microbiology	:	Rhodes & Fletcher.
12.	Industrial Fermentation Vol. I & II	:	Under Kofler & Hick.
13.	Dairy Microbiology	:	Foster Etal
14.	Industrial Microbiology	:	Rose

BOOKS RECOMMENDED FOR PRACTICALS

1.	Microbes in Action Taraporewala, Bombay.	:	Seely, Wander Mark
2.	Mannual of Microbiological Methods	:	A.J. Salle
3.	Microbiological Methods	:	Collins
4.	Difco Mannual.		

List of Instruments/Equipments with specification required for B.Sc.I, II and Final Microbiology Labortory.

Sr. No.	Name	Make	Specification	Quantity
1.	Autoclave a a.Portable	Yarco/Wiswo or any std.make	Pressure gauge 0-30 psi Size 350*325 mm. Double walled Non-Electrical	1.
2.	b.Vertical	Wiswo/Yarco	Electrically operated or anv std. make coil 2000 watts. Double walled mild steel body.	1.
3.	Hot-air oven	Yarco/tempo/ Lab.Hosp or any make	Double walled. Thermostat. Temp regulator. Size 45*45*45 cm.	2.
4.	Incubator	Yarco/Tempo/lab. Hosp. or any std make	Double walled Insulated temp. Temp regulator size temp. upto 60c with termostat sensitivity +0.5 c Size 45*45*45 cm	2.
5.	Refrigerator	Godrej/Kelvinator /BPL/std. and std. or make.	Double/Triple door with 250/300 lit. capacity having separate freezer.	1.
6.	Serological water bath	Yarco/Tempo/lab Hosp or and std. size	Double walled-Thermo regulated Max. Temp upto 80c 12*12*12"with Cover.	1.
7.	Magnetic stirrer with hot plate.	Yarco/tempo/ lab Hosp./or any std.make	2 Lit Capacity with 500 wt. Remi temp. regulated hot plate	1.
8.	Cyclo-Mixer	Remi/tempo/or anv std. make	For one test tube only	1.
9.	Centrifuge	Remi/R-8c/yarco or any std make	with replaceable swing out retorheads one to hold 8-16 tubes of 15 ml capacity Another head to hold 4 tubes of 50-100ml capacity	1.
10.	pH Meter	Systronics/Elico J.Mitra/or any std. make	Digital with glass electrade pH scale from 0 to 14. Resistant to temp. change.	1.
11.	Colorimeter.	Erma/Elicol systronics or anv.std.make	Digital-signal cell with either glass or quartz cuvetters visible range with coloured filters.	1.

12.	Distillation Assembly	Remi/Tempo/lab Hosp or any std. make.	2 litrs/hr.capacity with metal condensor.	1.
13.	Single pan Electrical balance	Systronics/K.Roy contac or any. std.make	Digital 125 gram capacity senstivity 0.01 gm	1.
14.	Mixer	Sumit/Hyoti/or any.std make.	with 3 Jars and Timer	1.
15.	Single pan balance (tripple beam)	National/Remi/ or any std. make	III gram capacity	2.
16.	Anaerobic Jar	Dynomicro/or any std. make	Capacity 10 Petri dishes complete set.	1.
17.	Rotarv shaker. Hozt.table top	Yarco/tempo/ or any std. make	Flask capacity 36 flask Remi or 250 ml Mechanical Variable speed motion size 24*24 platform	1.
18.	Automatic Pipette washer	Kumar/Modem or any.std.make	staineless steel 1 ml.5ml. 10ml capacities.	1.
19.	Over head Projector	Metzer/ photophone or any.std.make	complete with screen 72*50" Glass screen 16*16	1.
20.	Membrane Filter Assembly	Yarco/Tempo/or any.std.make	with Vaccum pump 0.5 h.p. Filter funnel Adaptor. Filtering Flask membrane filters 0.45 mm and 0.22 mm. for 125 filters compl set.	1.
21.	Microscope a. Monocular	Olympus/Metzer/ Labo.or any. std.make	Straight with Mechanical stage.mirror.bojectives 10x45x,&100x, Eve piece 5x,10x& 15x	20.
22.	Binocular	Olumpus/metzer/ Labo or any.	Inclined with Mechanical stage. Mirror lighting arrangement std.make objectivesb 10x, 45x,100x,Eve piece 5x,10x, and 15x.	5.
23.	Oil Immersion lens	Olympus/Meopta Labo/or any.std. make(preferably Imported)	Original(imported)with good spring load.	20.

24.	Autolet	Ames or any std. make	with laoncet holer lancet cover end cap.	2.
25.	Laminar Air-flow (Hozt) to be installed in Asceptic room)	Micro flit/or any std make	Complete with U.V. Light HEPA filter stainless steel top. side glass window pressure 25mm w.q.at rated flow D.O.P.efficiency 99.97% blower 1/4 hp. size 3'x2', 4'x2'	1.
26.	Ultra-violet light(to be Fitted in Asceptic room)	Amtres/Videocon or std.make	15 Watts/30 Watts of variable length	1.
27.	Air-Condi-tioner (to be installed in Asceptic Room)	Amrtx-Videocon or any.std make	Window Room A/C at list 1.5.ton capacity special filter or dust free air 4 wav air distribution Noiseless Standared compressors.	1.
28.	Asceptic room air-conditioner	10*10 Tatally Enclosed with	Dimension 10*10 with Air Conditioner and U.V.Light	1.
29.	B.O.D. Incubator	Toshiba/Kumar/ Remi or any std. make	Chamber size 45"x45"x45"x digital make temp range 5 c-60 sensitivity +0.5 230 volts.double walled Aluminium/ staineless steel.	1.
30.	Teaching aids Epidiscope	Metzer/ Photophone or any.std.make	500w. Imported Halogen illumination both for Diascopic projection with powerful and Noiseless colling system.An astigmatic lenses and Reflecting mirrors.	1.
31.	Slide projector	Metzer/300w. Photophone	Imported projection bulb Noiseless cooling system. Slide carries for slides 2"*2: and film strip carries with mask for 35 mm a best quality	1.

			projection lenses 8 German lenses 85 mm f. 2.8, coated lens.	
32.	Video cassettes	Indian/Imported	Practical Microbiology Applied Microbiology (Environement food) Industrial and medical Microbiology)	1. each
33.	V.C.R. & T.V.set	National/Sony Philips/Videocon or any.std.make	Recording & playing facility T.V. 21" withremote control	1. each
34.	Computer with printer and legal software	Intel pentium or any standard make.	Current configuration	01
35.	Lactometer	Std-Make	Glass/S.S.	1
36.	Water purifier with U.V. Light/ Filter	Eureka Forbes or any std-make	Filter, Activated carbon, U.V.Light Fully Automatic	1
37.	Micropipette	Std.Make	0.54/-1000 / Variable range.	1 each
38.	Paper Chromatographic Chamber	Std.make	Glass with lid	1

6. BIOCHEMISTRY

(Implemented from the Session 2005-06)

The examination in Biochemistry will comprise of two theory papers and one practical. Theory papers shall be of three hours duration and shall carry 60 marks each. The practical examination shall be of six hours duration in one day and shall carry 30 marks.

The following syllabus is prescribed on the basis of 3 lectures per paper per week and two practicals of three periods each on consecutive days.

PAPER - V

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

UNIT - I **A) Basic Concepts of Genetic Information**

a. Nucleic acids as genetic information carriers, experimental evidence e.g. bacterial genetic transformation, Hershey-Chase Experiment,

b. Central dogma of molecular genetics - current version, reverse transcription and retroviruses.

c. Salient features of eukaryotic, prokaryotic and viral genomes; highly repetitive, moderately repetitive and unique DNA sequences.

d. Basic concepts about the secondary structures of nucleic acids, 5′ —> 3′ direction antiparallel strands, base composition, base equivalence, base pairing and base-stacking in DNA molecule. T_m and buoyant density and their relationship with G-C content in DNA.

B) Structural Levels of Nucleic Acids and Sequencing

a. Waston and Crick model, A, B and Z types of DNA, major and minor grooves, chirality of DNA.

b. Structures and properties of RNA: Classes of RNA.

c. Nucleic acid hybridization.

d. Sequencing : Restriction and modification system; sequencing of DNA and RNA.

UNIT - II DNA Replication

DNA Replication in prokaryotes-conservative, semiconservative and dispersive types, experimental evidence for semiconservative replication. DNA polymerases, other enzymes and protein factors involved in replication. Mechanism of replication. Inhibitors of DNA replication.

Transcription

Transcription in prokaryotes, RNA polymerase, promoters, initiation, elongation and termination of RNA synthesis, inhibitors of transcription, Reverse transcriptase, post-transcriptional processing of RNA in eukaryotes.

UNIT - III Translation and Regulation of Gene Expression

a. Genetic code : Basic features of genetic code, biological significance of degeneracy. Wobble hypothesis, gene within genes and overlapping genes.

b. Mechanisms of translation : Ribosome structure, A and P sites, charges tRNA, f-met-rRNA, initiator condon, Shine-Dalgarno consensus sequence (AGGA), formation of 70S initiation complex, role of EF-Tu, EF-Ts, EF-G and GTP, non-sense codons and

release factors, RF-1 and RF-2.

c. Regulation of Gene Expression in prokaryotes : Enzyme induction and repression, operon concept, Lac operon, Trp operon.

UNIT - IV Basic Animal Biotechnology

a. History of Development of Cell cultures. Importance of growth factors of the serum, primary cultures, secondary cultures. Transformed animal cells - established continuous cell lines, commonly used animal cell lines-their origin and characteristics. Growth kinetics of cell in culture.

b. Applications of animal cell cultures for studies on gene expression. Organ culture.

UNIT - V Basic Plant Biotechnology

a. Tissue cultures, introduction and history. Media preparation and compositions. Totipotency and cell suspension culture. Use of growth regulators. Practical applications of tissue culture.

b. In-vitro techniques in tissue culture. Induction of cellus, ovary and ovule cultures, invitro pollination and fertilization. Practical applications of genetic transformation in plants.

PAPER - VI
IMMUNOLOGY, CLINICAL AND ENVIRONMENTAL BIOCHEMISTRY

UNIT - I

A) Immunology : Concept of immunity classification, humoral and cellular immunity.

B) Antigen : Definition, factors determining antigenicity, complete antigen, types of antigens.

C) Antibodies : Definition, structure, classification properties and differences.

UNIT - II Antigen - Antibody reaction :

Definition, mechanism and application of precipitation, agglutination, complement fixation and toxin - antitoxin reaction. Allergy and hypersensitivity. Cell and coombs classification, definition and description of I-IV types of hypersensitivity.

UNIT - III Clinical Biochemistry :

a. Basic concepts of clinical biochemistry. Definition and scope of clinical biochemistry in diagnosis. Brief review of units and abbreviations used expressing concentration and standard solution. Quality Control.

b. Manual versus automation in clinical laboratory. Collection and preservation of biological fluids (Blood, serum, plasma, urine and CSF). Chemical analysis of blood, urine and CSF. Normal values for important constituents (in SI units) in blood (Plasma/serum) CSF and urine clearance test for urea.

UNIT - IV Clinical Enzymology :

a. Definition of functional and non-functional plasma enzymes, isozymes and diagnostic tests. Enzyme pattern in health and diseases with special mentioned of plasma lipase, amylase, choline reterase, alkaline and acid phosphatase, SGOT and SGPT, LDH and CPK.

b. Hypo and Hyper glycemia, glycogen storage diseases, lipid malabsorption and statorrhea, albinism.

UNIT - V Environmental Biochemistry :

a. Air pollution : particulate matter, compounds of carbon, sulfur, nitrogen and their interactions, methods of their estimation, their effect on atmosphere.

b. Water pollution : types of water bodies and their general characteristics, major pollutants in domestic, agricultural and industrial wastes. Methods of their estimation. Effects of pollutants on plants and animals. Waste water management, solid wastes and their disposal.

PRACTICAL

SECTION – A : Clinical Biochemistry

1) Glucose Tolerance Test.
2) Liver function tests (SGPT/SGOT/Alkaline Phosphatase, Serum bilirubin)
3) Cardiac function tests (S.Cholesterol, CPK, Triglycerides, LDH-Cholesterol, HDL-Chloesterol, LDH)
4) Kidney function tests (Blood urea, S.creatinine, Serum Na^+, K^+)

SECTION - B : Immunology

1) Blood grouping
2) HbsAg (Pepatitis B/C)
3) Pregnancy test.

SECTION - C : Environmental Biochemistry

1) Qualitative tests for presence of pollutants, pesticides.
2) Qualitative tests for food adulteration.
3) Residual chlorine in water

SECTION - D : Molecular Biology

1) Extraction of RNA and its estimation.
2) Extraction and estimation of DNA

SECTION - E : Biotechnology

1) Immobilization of yeast cells.
2) Production of alcohol by utilizing immobilized yeast cells.
3) Development of Plant tissue callus.

Study Tour : A study tour shall be compulsory for all B.Sc.Part-III students.

Distribution of marks for Final Practical		**Marks**
Q.1.	Long Experiment.	
	One experiment for either section A/D/E	10
Q.2.	Short Experiment - I	
	One experiment from Section B	04
Q.3.	Short Experiment - II	
	One experiment from Section C	04
Q.4.	Record, Classwork & internal assessment	04
Q.5.	Viva	05
Q.6.	*Co-Curricular Activity Report	03
	Total : 30	

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

List of Books Recommended :

1) Molecular Biology of Gene (Latest Edition) by J.D.Watson Hopkins Robertis, Stertz, Weiner.
2) Genetics by Sandhya Mitra (TMH Publication)
3) Immunology by Roitt (Blackwell)

4) Gene VII by Lewis (Oxford)
5) Gene Structure and Expression by John D. Hawkins (Cambridge)
6) Plant Biotechnology S.Ignacimuthu S.J. (Oxford & IBH)
7) Gene Structure by Hawkins (Cambridge.)
8) Biotechnology – Application & Research edited by Paul Chere misinoff and Robert Ouellete (Technomic Publications)
9) Water Pollution – V.P.Kudesia (Pragati Prakashan)
10) Physicochemical Examination of water, sewage & Industrial waste – N.Mani WAsakam (Pragati Prakashan)
11) An Introduction to Plant Tissue and Cell Culture Emkay Publication.
12) Environmental Chemistry : Moore and Moore (Academic Press)
13) Chemical and Biological Methods for Water Pollution Studies : R.K.Goyal
14) Essentials of Molecular Biology : D.Freifelder
15) Cell and Molecular Biology : Darnell Lodish Baltimore.
16) Animal Cell Culture : Practical approach : R.J.Freshney
17) Plant Cell, tissue and organ culture (ed) J.Reinert & YSP Bajaj.
18) Fundamentals of Air Pollution by AC Stem.

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List of Instruments/Equipments/Glass-ware with specification required for B.Sc. Ist year Second yr. and Final (Biochemistry)Lab.

Instruments/Equipments:

Sr. No.	Name	Make	Specification	Quantity Required
1.	Photoelectric Colorimeter	Erma Japan J.Mitra Elico, Specol Systronic, Aimil Instrumentation or any one filters.	Single cell with either glass or quartz cuvettes vissible range with Coloured	1
2.	pH. Meter	Elico, Systronic J.Mitra	with glass electrode pH Scale from 0 to 14 Resistant to temp. change.	1
3.	Table centrifuge	"Remi Model R-8C" Tempo.	with replaceable Swing out rotor heads. One to hold 8-16 tuber of 15 ml capacity Another head to hold 4 tuber of 50-100 capacity.	1
4.	Incubator	Tempo. Lab.Hosp. Yarco.	Double walled insulated with double Foors. (Inner glass door) Tempo.upto 600C with thermostat. Sensitivity +0.50C Size: 455x605x455 mm.	1
5.	Hot-air Ovan	Yarco Tempo. Lab. Hosp.	Double walled Thermostal tempreture regulator. Size: 455x605x455mm.	
6.	Refrigerator	"Voltas" "Goderj" Allwyn Kelvinator or any make.	Double door with 300 Lit. capacity. having separate freezer.	1
7.	Serological water Bath	"Tempo" " Lab. Hosp" Yarco or any make.	Double walled Thermoregulated. Mix. temp.upto 800 C Size: 12x15x12 with cover.	1
8.	Magnetic Stirrer with Hot	"Tempo" "Remi" Lab Hosp. or any make	2 Lit. Capacity with 500 Wt. temp. regulated or any hot plate.	1
9.	Metal Water Disti-llation plant	"Remi" "Tempo" Lab.Hosp.	2 Lits/Hr capacity with metal condensor.	1
10.	Thin Layer Chromato-graphy Assembly	--- --- ---	Chamberor of Glass Tank Spreader Glass Plates Stage for glass Plates.	1

11.	Hot Plate	"Tempo" "Remi" "Lab. Hosp." or any make.	Round 7 Diameter with 3 way control switch. 1000 watts.	2
12.	Mixer	"Remi" "Sumit" any make.	with 3 jars and timer.	1
13.	Single Pan Balance (Tripple beam)	National Scientific Work VARANASI	100gm. capacity	2
14.	One Pan Electric Balance	Umex Instraments works. VARANASI	100 gm. Capacity. Accury upto 4th decimal of gm.	1
15.	Cyclo-Mixer	"Vortex" "Remi"	For one test tube only	1
16.	Laboratory Microscope	"Olympus" or any make. scope with	Monacular Medicial micro- Sliding stage.	4
17.	Fingure pricking nedle.	"Auto Let" Japan	with Disposable Needler.	2
18.	Haemometer Sahil's	GDR make or Top.	with Comparator Glass, Tube and Hb pippet	2
19.	Neubauer's Counting Chamber.	---	with Bright rullings.	4
20.	RBC Pipettes	GDR or England mak or any make.	---	25 Nags.
21.	WBC Pipittes	-do-	---	25 Nags.
22.	lab. Cell Counter	any make	---	5 Nags.

GLASS-WARE:-

1	Test Tubes	Borosil/Corning/Vensil	20ml capacity	1000 Nos.
2.	Centrifuge	Borosil/Corning/Venisl	15ml capacity	100 Nos.
3.	Folin-Wu Tubes	Corning/ Borosil/ Vensil	25ml capacity with bulb.	50 Nos.
4.	Nesseler's Tubes	Corning/ Borosil/ Vensil	25 ml capacity with 12.5 ml mark.	50 Nos.
5.	Boiling Tubes (Hard glass)	Corning/ Borosil/ Vensil	50ml capacity	60 Nos.
6.	K.T. Tubes	Borosil/ Corning/ Vensil	5 ml capacity	20 Nos.
7.	Burettes	Emkay or any make	50 ml capacity with stop cock	20 Nos.
8.	Microburettes	Borosil/Emkay	10 ml	10 Nos.
9.	Pipettes	Corning/ Borosil/ Vensil	10 ml capacity with graducation	20 Nos.
			5 ml capacity with graduation zero at tip	20 Nos.
			1 ml capacity (graduated)	20 Nos.
			0.2 ml capacity (graduated)	20 Nos.
			0.1 ml capacity with graduation zero at tip.	20 Nos.
10.	Measuring Cylinders	Corning/ Borosil/ Vensil	1000 ml graduated	1 No.
			500 ml graduated	1 No.
			100 ml graduation	5 Nos.
			50 ml capacity with graduation	5 Nos.
			10 ml capacity graduation	3 Nos.
11.	Standard Volumetric Flasks	Corning/ Borosil/ Vensil	1 Lit. capacity	3 Nos.
			500 ml capacity	5 Nos.
			250 ml capacity	12 Nos.
			100 ml capacity	20 Nos.

12	Beakers	Corning/	1 Lit. capacity	5 Nos.
		Borosil/	500 ml capacity	30 Nos.
		Vensil	250 ml capacity	30 Nos.
			100 ml capacity	50 Nos.
13.	Conical	Corning	500 ml capacity	30 Nos.
	Flasks	Borosil	250 ml capacity	30 Nos.
		Vensil	100 ml capacity	30 Nos.
			50 ml capacity	30 Nos.
14.	Reagent	Emkay	2 Lit. capacity	5 Nos.
			1 Lit. capacity	5 Nos.
			500 ml capacity	100 Nos.
			250 ml capacity	100 Nos.
15.	Dropping Bottle.	Emkay	100 ml capacity	10 Nos.
16.	Flat Bottom Round Flask	Emkay	500 ml capacity	20 Nos.
17.	Funneis	Emkay	2.5" diameter	20 Nos.
			3" diameter	20 Nos.
			6" diameter	3 Nos.
18.	Glass Tubings		1/2 mm.	1 kg.
19.	Glass Rods		1/2 mm.	1 kg.

MISCELLENIOUS:-

1.	Propipettes	Any make	Able to hold any pipettes from 0.1 ml to 10 ml capacity Rubber or Plastic.	5 Nos.
2.	Test tube Stands	Tarson	To hod 12 Tubes	20 Nos.
3.	Burette stands	--- ---	Metal rod and base with tarson clamp.	20 Nos.
4.	Rubber Crock		To fit in concial flasks of all capacity.	20 each
5.	Procelain Giazed tiles		6x6"	20 Nos.
6.	Mortor and Pestal	---	6" diameter	1 Nos.

7. COMPUTER SCIENCE

(Implemented from the Session 2006-07)

The Examination in Computer Science will comprise of two theory papers and a practical examination. Each theory paper will be of three hours duration and carry 60 marks. The practical Examination will be of 6 hours duration and carry 30 marks.

The distribution of marks in practical examination is given as :-

1)	Experiment Programme	09 Marks
2)	Experiment Programme	09 Marks
3)	*Co-curricular Activity Report	03 Marks
4)	Viva-voce	05 Marks
5)	Record	04 Marks
		Total : 30 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

Each unit of theory paper will carry two questions with internal options to solve any one question.

The syllabus is based on 6 theory periods and six practical periods per week. Candidates are required to pass seperately in theory and practical. In case of programming langugae standard ANSI version of languages is to be followed.

Paper-V
Relational Database Management System

Unit-I : **Fundamentals of DBMS:** Architecture of a database system, Data independence, Database models; Relational, Hierarchical, network; Data Dictionary, views, DMI operations on views.

Unit-II : **Relational Model :** Relations, Domains & Attributes, keys, E-R diagrams, Reducing E-R diagrams to tables, functional dependancy, Normalization process, Normal forms: 1NF, 2NF, 3NF, 4NF, BCNF.

Unit-III : **Introduction to SQL;** components of SQL, data types, operators. DDL commands : CREATE, ALTER, DROP for tables & views,

DML commands : SELECT, INSERT, DELETE & UPDATE, order by, Group By & Having clause.

Unit-IV : **Functions :** Number functions : AVG, MAX, MIN, SUM, COUNT, TO NUMBER, GREATEST, LEAST, ABS, MOD, FLOOR, CEIL, TRUNC, SQRT, SIGN, SIN COS, LOG, EXP, Character function : (Concatanation function), DECODE, INITCAP, INSTR, LENGTH, LOWER, LPAD, LTRIM, RPAD, RTRIM, SOUNDEX, UPPER, Joins, Unions.
Data Integrity, types of integrity constraints, displaying integrity constraints.

Unit-V : **PL/SQL :** Features & Block structure, variables and constants, data types, control structure.
Cursor : Concepts of cursor, types, declaring, opening, using cursors, fetching data, closing a cursor, cursor attributes.
Transaction : Rollback, Commit and autocommit, save point, Rollback segment.

Unit-VI : Features of SQL* form and SQL* report.
Users, Roles and Previleges : Concept, creating users, system and object previlage, GRANT previlege, REVOKE previlege, passing on previleges, creating roles.

Books Recommended :

1) An introduction to database system : C.J.Date-Narosa.
2) Database Management System : Majumdar & Bhattacharya - TMH.
3) Oracle the complete reference : Koch & Loney - TMH.
4) Understanding oracle : Perry & Latic - BPB
5) Essential of oracle 8 : TOM Lewis.

Paper-VI
Visual Basic

Unit-I : **Introduction to Visual Basic :** Visual nature, programming process, event driven programming, VB environmental, new project window, tool bar, menu bar, tool box, form window, form layout window, project window, property window.
Managing Control : Form properties, pointer tool, label control, text box, command button, picture box, image control, control focus, event procedure.

Unit-II : **Creating menus :** Application wizard for menu, menu editior, working with menu editor, analysing VB data, code window,

data in VB, variables in VB, storage of variables.
Operators , order of operatros, conditional operatros, conditional data, logical operators, if statement, if-else, nested if-else, select case, goto statement, do loop, for loop, nested for loops.

Unit-III : **Introduction to internal functions :** Msgbox(), using named constants, triggiring default buttons, specifying the icon, input box(), handling the keyboard, creating and analysing : initial form, check box form, option button form.
VB programs : Program structure, private & Public procedure, variables code, passing data by reference and value passing controls as arguments. Internal functions : Numeric function, data type functions, string functions, special functions.

Unit-IV : **Dialog box control :** Need for Dialog box control, adding the Dialog box control, working with the common control, producting the color Dialog box control, handling the cancel button, producing the font Dialog box, producing the open Dialog boxes, producing file save Dialog boxes, producing the print dialog boxes.
Mouse and control : Mouse response, list box controls, combo box control, timer control, working with arrays, declaring arrays, multiple list boxes, adding the code.

Unit-V : **Working with forms :** Properties, events and methods, Form collections, accessing the form collection using the subscripts, the count property, uploading forms, placing text on forms, format with print, positioning the print method, creating new properties for forms, multiples forms, placing toolbars on forms, adding toolbars.

Unit-VI : **Working with files :** Open statement, file modes, locking the file, close statement, working with sequential access file, print# statement, input# statement, write# statement, working with random-access file, put statement, get statement, defining user-defined data types, file controls, drive list box, directory list box, file list box, file-related commands.

Books Recommended :

1) Visual Basic 6.0 in 21 days - Greg Perry - Techmedia
2) Visual Basic 6.0 The Compelete reference - Noel Jerke - TMH
3) Mastering VB 6.0 - Evangelos Petroutsos - BPB
4) Guide VB- 6.0 Black Book - Peter Norton Techmedia.

Practicals :

Group A : Minimum 16 practicals based on Visual Basics covering all aspect of syllabus.

AND

Group B : Minimum 16 practicals based on RDBMS covering all aspects of syllabus.

Study Tour : Study tour may be arranged to computer Industry or software development organisation or software technology park or IT park.

List of Equipments :- (Minimum requirement) For Computer Science for B.Sc. Part-I, II, III.

I) Hardware :-

a) Computer Terminals : 10 Nos.
Desirable configuration : Computer with latest configuration.

b) Printer (DMP) - 2 Nos.
Desirable configuration :- 24 pin- 132 / 80 columns.

c) Inkjet Printer - 1 No.

II) Accessories :-

1) Floppy boxes, 1.44 MB or 1.2 MB - 2 Boxes.
2) Printer ribbon (Cartridge)
3) Printer Stationary - 5000 sheet.
4) Stabilizer / UPS
5) Internet facility.

III) Softwares legal version based on syllabus.

IV) Other accessories be available based on syllabus.

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8. ENVIRONMENTAL SCIENCE

(IMPLEMENTED FROM THE SESSION 2008-2009)

The syllabus is based on 6 theory periods and 6 practicals periods per week.

The examination shall comprised of three theory papers and one practical. Each paper is divided into five units. There shall be one question on each unit with internal choice. Examination shall be of three hours duration and carry 40 marks. The practical examination shall be of six hours duration and carry 30 marks.

PAPER - VII

ENVIRONMENTAL POLLUTION

Unit-I Introduction to Environmental Pollution :

(A) Defination, Basic types, sources (origin), Pollutants-defination and classification.

(B) Air Pollution - Defination, classification of air pollutants. Pollutants - COx, NOx, SOx & Particulates, Photochemical smog. Effect of Meterological parameters on air pollution - Temp., wind, Rainfall, Radiation.

Unit II (A) Global Warming, Climate change, ozone depletion, Green House Effect.

(B) Air sampling - objectives & methods. Analysis. Effects of air pollution on plants, animals & human beings. Preventive measures & control techniques. Bhopal Gas tragedy.

Unit III Water Pollution :

(A) Defination, Types of water pollution, types of pollutants, methods of sampling, handling preservation and analysis.

(B) Pollution Parameters : Physical Chemical & Microbial. Thermal Pollution, Eutrophication, Drinking water quality standards.

Unit IV (A) Chemical Specification of Pb & Hg. Trace Elements as pollutants. Indicators of water pollution.

(B) Marine Pollution : Defination, sources, types of pollutants, oil spill, control measures, coastal management.

(C) Effects of water pollution on plants, animals & human beings.

Unit V Noise Pollution :

(A) Defination, sources, properties of noise, measurement & its indices. Effect of noise on human health, prevention & control measures.

(B) Radioactive Pollution : Defination, sources, properties, radioactive fallout, effects & control measures.

PAPER VIII

ENVIRONMENTAL POLLUTION & CONTROL

Unit I Sewage : Composition, properties Treatment- Objectives, primary, secondary & tertiary treatments, Permissible Standards for sewage disposal.

Unit II Drinking Water Treatment - Aeriation, sedimentation, coagulation, rapid sand filter. Methods of disinfection - Chlorination, Ozonation, UV-rays.

Unit III (A) Solid Waste : Defination, types, compositio, sources. Solid Waste Treatment methods & Disposals.

(B) Waste Water Treatment in - Pulp & Paper, Sugar industries.

Unit IV Instrumentation : Colourimetry, Spectrophotometry, Chromatography, Atomic Absorption, Spectrophotometry, GLC, HPLC, flame photometry. pH Electrode, Conductivity Cell, High Volume Sampler.

Unit V Statistical Method :

(A) Mean, Standard Deviation, Tabulation of data, types of data, diagrammatic & Graphic representation of data.

(B) Nature of Ecological and Environmental Data - Collection of Data. Measures of dispersion, range, inter-quarantile of variation, correlation and regression.

PAPER IX

ENVIRONMENTAL CONSERVATION & MANAGEMENT

Unit I (A) Principles of Management : Nature & importance. Introduction to role of environmental management systems, EMS in industries.

(B) Mining Environment : Types, problems and issues, mining management, strategies for conservation of minerals.

(C) Land Use Pattern, land degradation and land management. Waste land types, problems and restoration and conservation.

Unit II (A) Water Budget of Earth, current status of availability, rain water harvesting , water shade management, River restoration.

(B) Forest - Indian forest scenario. Exploitation of forest, forest management strategies for ecological balance. Joint forest management.

Unit III (A) Wild Life Management - Wild life as a resource. Threates to wild life. Indian board for wild life (IBWL). WWF, National Wild Life Action Plan. Wild life institutes in India. Wild life poaching. National parks and wild life sancturies.

(B) Legislation - Wild Life Protection Act, 1972, Water (prevention &control) Act 1974, Forest Conservation Act, 1980,

Environmental Protection Act, 1986, The Air (Prevention & Control) At, 1982, Noise Pollution (Regulation & Control) Act, 2000. Biomedical Waste (Management and Handling, 1998)

Unit IV Role of National and International Organization in Environmental Protection :

(A) IUCN, UNEP, Global Environmental facilities, Man and Biosphere Programme, Environmental Protection Agencies, Central and State Protection Control Board and its role. Green rating project.

(B) Environmental Impact Assessment - Defination, concept, scope and objectives, Methodologies of EIA.

Environmental Auditing :- Scope, objectives, Green bench, Ministry of Environment and Forest (MOEF) its function.

Unit V (A) Disaster Management - Identification and mitigation of Hazards, safety and planning. Major Indian Disasters.

(B) Introduction to Remote Sensing, Study of Arial Photographs and Satellite Imageries. Geographical Information System (GIS) - Defination, advantages, applications, GIS for Environmental Management in Environmental Impact.

Concept of sustainable development ISO 14000.

Practical based on papers :

1) Experiments on Water Analysis :-
   a) Determination of BOD from given water sample.
   b) Determination of COD from given water sample.
   c) Estimation, toal Kjeldhal Nitrogen.
   d) Estimate the Phosphate from water sample.
   e) Estimate the fluorides from given water sample.
   f) Estimation of resudial chlorine.
   g) Estimation of Trace elements.
   h) Estimation of Synthetic Detergents.
   i) Mcrobial Analysis of Water.
   j) Estimation of Oil & Grease
   k) Estimation of TS, TDS, TSS, TVS.
   l) Estimation of Na, and K by flame photometer.

m) Estimation of Sulphates by Gravimetry and Spectrophotometer
n) Estimation of H_2S from given water sample.
o) Estimation of Trace Elements by paper chromatography
p) Removal of Hardness by Ion Exchange method.
q) Estimation of Chlorides from given water sample
r) Estimation of Chlorine dose from drinking water.
s) Estimation of Alum dose by Jar test.

2) Experiment on Air Analysis :-
   a) Determination Sulphation Rate.
   b) Estimation of settlable particulates by dust fall jar.
   c) Qualitative Determination of SO_2, CO_2, and smoke after burning of Coal.
   d) Sampling and Analysis of Air Pollutants by High volume sampler.
   e) Sampling and study of Aeromicrobial flora.
   f) Measurement of CO_2 concentration in air by Zincondroff method.
   g) Seperation of gas components (O_2, N_2, CO & CO_2) by Orsat apparatus.
3) Measurement of Noise Level.
4) Study of Satelllite Imagery or Arial Photographs.

DISTRIBUTION OF MARKS OF PRACTICAL EXAMINATION

Maximum Marks - 30 **Duration : 8 Hrs**

Q.1	Any one Experiment on Water Analysis	-	8 Marks
Q.2	Any one Experiment on Air Pollution or Noise Pollution	-	8 Marks
Q.3	Project Work Report Submission	-	6 Marks.
Q.4	Class Record + Viva-Voce	-	5 Marks
Q.5	*Co-Curricular Activity Report	-	3 Marks.

Note: Visit to-1) Wild life Sanctuary, 2) Paper Pulp and Sugar Industry, 3) National Park, 4) Meteorological Station.

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

Required Instruments or Equipments for Practical Work :

1. Spectrophotometer
2. COD reflux assembly
3. BOD bottles.
4. Incubator
5. Kjeldhal Nitrogen Assembly
6. Paper Chromatograph
7. Flame Photometer
8. Dust Fall Jar
9. Sound Level Meter
10. High Volute Sampler
11. Water Sampler
12. Lovered Box
13. Air Sampler - Tilak
14. Zincondroff Apparatus
15. Orsat Apparatus
16. Stereo Scope
17. Aerial Photograph.

Instructions for Project Work :

The objective of assigning of project work to student is to provide an opportunity to understand and appreciate environmental problems and explore probable solutions based on Empirical Studies. With a view to achieve these objectives. It is Expected that students in consultation with the concerned member of teaching faculty identifies an environmental problem and under take studies during specific period. While defining aim and the scope of the project, feasibility interms of available time should be duly considered. It would be desirable that the initiation of project work begins in first session by under taking library work under the guidance of concerned teacher. The theme of project should be finalise in all respects at a convenient.

A student is expected to carry out studies as preplanned by going on periodic field visits and carry experimental studies. It is visualise that continuous to the teacher and consultations with him is the essence of successful work on completion of the field work and laboratory work, the

teacher is expected to guide the student in writing a project report in a standard format.

The final project report should be duly certified by the Concerned teacher as the work carried out by a student individually or collectively.

Books Recommended :

1. Text Book of Environment by Agrawal K.M.
2. Water Pollution by Abbasi, S.A.
3. Introduction to Environmental Science by Anjaneyuluy.
4. Environmental Problems and Solutions by Asthana D.K.
5. Environmental Pollution and Control by Bhatia S.C.
6. Text Books of Environmental Chemistry and Pollution Control by Dara S.S.
7. Environmental Chemistry by A.K.Day.
8. Fundamentals of Environmental Pollution by K.Kanna.
9. Environmental Sanitation by B.S.Kapoor.
10. Fundamentals of Biostatistics by Khan.
11. Environmental Pollution : Monitor and Control by S.M.Khopkar.
12. Air Pollution - by V.P.Kudesia.
13. Methods in Biostatistics by B.K.Mahajan.
14. Pollution Controlling Process Industries by S.K.Mahajan.
15. Air Pollution and Control by Muralikrishna.
16. Environmental Management by G.N.Pande
17. Environmental Chemistry by B.K.Sharma.
18. Pollution Management in Industries by R.K.Trivedi.
19. Encyclopedia of Environmental Pollution Control by R.K.Trivedi.
20. Ecotechnology for Pollution and Control and Environmental Management by R.K.Trivedi and A.Kumar.
21. Chemical and Biological Methods for Water Pollution Studies by Trivedi G.
22. Chemical Methods for Environmental Analysis by R.Ramesh.
23. Waste Water Engineering by Rangwala.
24. Instrumental Methods in Chemical Analysis by Chatwal and Anand.

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9/10. INDUSTRIAL CHEMISTRY/ INDUSTRIAL CHEMISTRY (REGULAR/VOCATIONAL)
(Implemented from the Session 2004-2005)

There shall be the following papers and practicals for B.Sc.Final Examination.

There shall be three compulsory papers in theory each of 3 hrs. as stated below and practical examination duration shall be of 6-8 hrs. Every examinee shall offer the following three papers of 40 marks each and practical examination of 30 marks.

Paper-VII

Chemical Process Economics, Heavy and Fine Chemicals

Unit I **Process Economics**

(A) **Cost Estimation :** Cash flow for industrial operations, cumulative cash position, factors affecting investment and production cost and cost indexes.

(B) **Interest :** Simple and compound,nominal and effective interest rate, present worth and discount.

(C) **Depreciation -** Introduction, service life, salvage value. Methods for depreciation, straight line method, declining balance method and sum of the vear digilits method.

Unit II **(A) Profitability**

Introcution, profitability, standards, profitability criteria, Profitability evaluation : Rate of return on investment and discounted cash flow, method.

(B) Economics of selecting alternatives, variation of cost with capacity, break even point, optimum batch sizes and production scheduling.

Unit III **Manufacture of the following**

Ammonia, nitric acid, ammonium sulphate, ammonium nitrate, caustic soda, chlorine, ammonium phosphate, superphosphate and triple superphosphate with reference to following considerations :-

(i) Consumption pattern (ii) raw material, (iii) quality control (iv) hazards and safety.

Unit IV **Manufacture of the following -**

Lime, gypsum, calcium carbide, silicon carbide, fluorine, bromine, iodine, sodium chloride, sodium sulphide, sodium sulphate with reference to -

(i) consumption Pattern (ii) raw material (iii) quality control (iv) hazards and safety.

Catalysts - Raney nickel, Platinum and Vanadium pentoxide.

Unit V **Dyes**

Introduction, classification of dyes. On the basis of mode of applications and on chemical constitution. Acid dyes, basic dyes, sulpher dyes, pigment dyes. Dye intermediates Manufacture of methyl orange, indigo dye, picric acid and aurine dye.

Paper-VIII

Fine, Speciality and Industrial Chemicals

Unit I **(A) Essential Oils -** Introduction, extraction of essentials oils, uses of essential oils, Camphor, menthol, citral, terpenal, Fruit flavours and artificial flavours.

(B) Analysis of edible oils. Ester value, acid value, iodine value, Reichert Meissl value.

(C) Soaps, manufacture, toilet soaps, recovery of glycerine from soap industry, cleaning action of soap, Detergent, types of detergents.

Unit II **(A) Manufacture and uses of following solvents -**

Diethylether, DMF,THF, DMSO,dioxane, dibutyl ether, acetonitrile, methanol. Purity from chromatographic and spectroscopic point of view.

(B) Manufacture and uses of following chemicals -

Phenol, acetone, resorcinol, sorbitol, phthalic anhydride, formaldehyde, formic acid.

Unit III **(A)** Fischer Tropsch synthesis with examples.

(B) Chlorination of methane and its control.

(C) Mono, di and triethanolamines (preparation and uses)

(D) preparation and uses of acetylene, vinyl acetate, propyl alcohol, acrylates, vinylchloride.

Unit IV **Classification of drugs.**

Preparation and medicinal uses of following drugs

Ibubrofen, mefenamic acid, vitamin A, vitamin C, vitamin D, Vitamin B2 and B6.

Unit V **Manufacture and uses of following Chemicals**

Lithium aluminium hydride, aluminium alkoxide, titanium tetrachloride, titanium dioxide, borax boric acid, sodium thiosulphate, graphite, sodium borohydride, sodium methoxide and sodium ethoxide.

Paper IX

Instrumental Method of Chemical Analysis

Unit I (A) Sampling Procedures, Sampling of bulk materials, techniques of sampling solids, liquids, gases, Collecting and processing of data.

(B) Errors - types of errors, nature and origin of errors, Accuracy, precision, mean deviation, standard deviation, relative standard deviation and confidence limits.

Unit II **Chromatography :**

Classification of chromatographic techniques - partition, adsorption, size exclusion, Principles, techniques and applications of paper chromatography, TLC, GLC and HPLC.

Unit III (A) **Solvent Extraction** : Classification of solvent. Extraction systems, basic principles involved in extraction. Factors affecting extraction techniques of extraction, application of solvent extraction in industries.

(B) **Ion Exchange :** Classification of ion exchangers, ion exchange equilibria, ion exchange capacity, chelating ion exchangers, factors affecting the separation of ions and applications in analytical Chemistry.

Unit IV **Optional Methods**

(A) **Flame Photometry :** Elementary theory, Instrumentation and experiemental techniques, Combustion flames and applications.

(B) **I.R.Spectroscopy :** Principles, techniques, instrumentation and applications in Chemical analysis of industrial materials.

(C) **X-ray Fluorescence** - Principles, techniques, flow sheet, applications for determination of heavy metals in enviornmental samples.

Unit V Organo Analytical Chemistry

Outline of micro, semi micro and micro analysis. Semi micro and micro balances and their use in analysis. Determination of following functional groups in organic compounds.

N-acetyl, hydroxyl (both alcoholic and phenolic) amino, aldehyde, ketone, sulphonamides. Karl Fischer reagent for determination of moisture.

B.Sc.Final (Practicals)

(Industrial Chemistry)

Section - A

Synthesis of common industrial compounds involving two step reaction -

3-nitroaniline, sulphonilamide, 4-bromoanilinc, 4-nitrobenzoic acid.

Section-B

Industrial Analysis - Analysis of common raw materials as per the industrial specifications - phenol, Aniline, Acetone, formaldehyde, Hydrogen peroxide.

Determination of saponification, acid and iodine values & fatty acid in edible oils.

Section-C

Intrumental methods of Analysis.

Paper Chromotography :

1. Separation of two metal ions i.e. (Cu,Ni), (Co,Ni), (Al,Fe)
2. Separation of plant pigments xanthophyll, chlorophyll, carotene.
3. Separation of Amino acids.

Thin layer Chromatography (TLC)

1. To detect the impurity in organic compounds.
2. Separation of two drugs in combined dosage form.
3. Separation of dyes & dye intermediates
4. Detection of insecticides in vegetables.

Column Chromatography :

1. Separation of dyes and dry intermediates

Ion Exchange :

1. Removal of hardness (Ca^{2+}, Mg^{2+}) from water
2. Separation of Ni^{2+} & Co^{2+}
3. Separation of Chlorides, bromides & iodides.

Solvent Extraction :

1. Separation of (Cu+2 & Ni+2) or (Cu+2 & Co+2) by solvent extraction.

List of Books

1. Quantitative Inorganic Analysis - A.I.Vogel.
2. Instrumental Methods of Chemical Analysis - Willard, merit & Dean.
3. Introduction to Instrumental Chemistry R.D.Braun.
4. Quantitative Analysis by Dey & Underwood.
5. Chromatography - Shrivastava & Shrivastava.
6. Physico-chemical Analysis Y.U.Lvalikov.
7. Methods of Chemical Analysis Khopkar.
8. Analytical Chemistry - I.G.Dick
9. Instrumental Methods of Analysis Skoog and Wast.
10. Chemical Process Industries - Shreve R.N. Mc Gross Hill Book.
11. Applied Organic Chemistry Kilner E and Samuel DM. Mac Donaled & Evans Ltd.
12. Introduction to material Science & Engineering K.M.Rells.
13. Unit Process in Organic Synthesis - P.H.Groogins.
14. Heavy organic chemical - A.J.Gartc. Pargmon Process U.K.
15. Chemical from Petroleum Chemicals- R.Jonson, Royal Society.

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11. PETROCHEMICAL SCIENCE

(Implemented from the session 2004-2005)

The syllabus is based on six theory periods and six practical periods per week.

The examination in Petrochemical Science will comprise of two theory papers and a practical. Each theory paper shall be of three hours duration and carry 60 marks. The practical shall be of six hours duration and shall carry 30 marks. The distribution of practical marks shall be as follows :

1.	Record	5 marks
2.	Viva-voce	10 marks
3.	Exercise	15 marks.
	Total	: 30 Marks.

PAPER-V

Petrochemical Science-I

Unit I : Butadine manufacture : various processes like recovery from C4-fraction of steam - naphtha cracking effluent stream, Dehyrogenation of butylenes, Dehydrogenation of butane, (Houdry process), Dehydration of ethyl alcohol, Various techniques used like extractive distillation, selective extraction, Lebedev process, catalysts used with their details, Equilibrium composition, effect of temperature and pressure.

Unit II : Uses of butadine, Introduction to rubber manufacture, synthesis of isoprene b y various routs like Goood year scientific Design processes, Dehydrogenation of tertamylenes (Shell processes), Acetone-acetylene route, Isobutylene- fermaldehyde route, dehydrogenation of C5-stream.

Chemistry of most economical process, flow sheet and other details. Other products like adipic acid, sulpholane, chloroprens from butadine and other sources.

Unit III : C8 Aromatics, occurence, principal sources for BTX, production of BTX, physical properties of BTX aromatics, catalytic, reforming as a source of BTX, main reactions in catalytic reforming, catalyst used, processes detail, Effect of temperature, pressure etc, aromatics from polymer gasoline.

Purification by extractive distillation, BTX fractionation, Benzene by dealkylation of Toluene, Disproportionation of Toluene for Benzene and Xylenes, separation of xylenes, isomerisations of xylenes.

Unit IV : Benzene Derivatives, derivatives with halogenes, ethyl benzene, polymethyl benzene, psedocumene, durene, dehydrogenation of ethyl benzene for styrene. Other sources for styrene and uses of styrene. naphthalene - chemistry, production, process description, market and applications. Synthesis of bisphenol-A, epichlorohydrin, diisocyanates, penta arythritol.

Unit V : Sources of cyclohexane, Comparison of boiling points of C6-cut naphtha fraction, production of cyclohexane IFP process, lumus process, market for cyclohexone, cyclopentadiene synthesis,

Caprolactum - various feed for caprolactum synthesis, Benzene route, Du-pont process, Toyo rayon photochemical process, Union Carbide process, HPO process, Hexamethylene diamine.

Adipic acid synthesis, sebacic acid synthesis, lauryl lactum.

Nylon : Monomers and raw materials, polycarbonates, chemistry involved in synthesis of polyamides, Nylone 66, Nylon 6, Nylon 11, Nylon 7, Nylon 6-10, Nylon 12.

Paper-VI

Petrochemical Science-II

Unit I : Production of Phenol : various routes, cumene route, chlorobenzene route, from toluene (Dow process), from cyclohexane, Raschig process, types of catalyst used, effect of temp. and pressure, application of phenol.

Cumene manufacture by alkylation of benzene, Bisphenol-A. Product from toluene like chlorotoluene, sylphonation of toulene, nitrition of toulene, synthesis of o-cresol, dinitrotoluenes, Toluene disocynates (TDI). Aniline : synthesis, mixed acid-term. (from Nitrobenzene); ammonolysis, chemistry, process flow and uses.

Maleic anhydride - Vapour phase oxidation of benzene, from butane i.e. benzene route and non-benzene route.

Nitrobenzene : synthesis and uses.

Unit II : Oxidative products of - Toluene, like benezaldehyde, benzoic acid, Terephthalic acid synthesis : p-xylene oxidation route, toray

industries process, lummus process and various commercial process for p-xylene oxidation to TPA, their comparison, uses of TPA.

Synthesis of dimethyl terephthalate, DMT VS TPA route for polyethylene terephthalate, methylation of terephthalic acid.

Tranesterfication with diols, polymersation of glycol terephtalate, Polyester - saturated polyester, PET, unsaturated polyerter. phenol Formaldehyde resins, Urea resin, melamine formaldehyde resin, epoxy resin. (only chemistry).

Unit III : Phthalic Anhydride : Various routes - their comparison, o-xylene route, Naphthalene route, phthalonitrile, uses of Phthalic unhydride Introduction to synthetic detergents. Chemistry of Sulfonation of LAB, AB and alfa olefines.

Introduction to carbon black, production of sulfur, carbondisulfide, hydrogen from petroleum source. (introductory).

Pesticides from petroleum - Introduction, raw materials for organic pestcides, synthesis, structure and biological activity of organic pesticides, future pesticides.

Petroleum protein, organic dyes & their synthesis, petrochemical base explosives, their synthesis & applications.

Unit IV : Catalysts in Petroleum refining and Petrochemical Processes -

Homegeneous and heterogenous catalysts, catalyst morphology and activity,

Catalysts for petroleum refining : Cracking catalyusts, Reforming catalysts, hydrotreating catalysts.

Catalysts for Petrochemical Industry, Hydrogenation catalysts, Hydrocarbon oxidation catalysts, polymerisation catalysts, cationing & anionic catalysts. Ziegler catalyst.

Recent advances in industrial catalysts -

Dual functional catalysts, super active metal catalyst, supported Ziegler catalyst, advances in homogenous catalyst, Role of polymer in catalysis.

Unit V : Future of Petrochemicals -

Integrated petrochemical complex, concept of chemical refinery, Energy crisis & the petrochemical industry, NG as a petrochemical feedstock, Impact of heavy feedstocks on petrochemicals,

Ecology & Energy crisis, coal as an alternative to oil, Engergy orisis and the industrial fuel, synthetic fuel, hydrogen : fuel of tomorrow.

Trends in petrochemical industry, development in cracking technology, olefines Vs. paraffins, biomass renewable resource for petrochemicals.

(Note : The subject should be taught giving elobrated consideration to thermodynamics, kinetics, mechanism, catalyst involved, process conditions, type of reactors and separation and purification of the product.)

Practicals :

1. Prepared certain petrochemicals using chemical processes like, oxidation hydration, hydrogenation, halogenation, nitration etc.
2. Prepared certain polymers like Nylone 6, Nylone 6-6, polystrurene etc.
3. For above laboratory prepare chemicals and polymers cheak the Physical; and chemical properties like melting point, boiling point, viscosity, viscosity index, moisture content, impurites present, ash content, residue, inorganic material presents etc.
4. Collect the various petroleum sample like gasoline, kerosene, diesel, oils etc and cheak the complete specification of these products in laboratory.
5. Visit to near by petrol pump and see the storage and handling of petroleum products and also note the method of product testing they are using.
6. Visit to near by L.P.G. bottleing/filling plant, chemical plant and note the unit orperations and unit processes they are using.

BOOKS RECOMMENDED :

GENERAL TEXT BOOKS

1. Basic Organic Chemistry, Part 5, Industrial Products, J.M.Tadder, A.Nechvatal and A.H.Jubb, John Wiley, London(1975)
2. Industrial Organic Chemistry, K.Weissermel and H.J.Arpe, Verlag, Chemie, New York (1978)
3. Chemicals from Petroleum, A.L.Waddams, 4th edn., Murray, London (1978).
4. An Introduction to Industrial Organic Chemistry, P.Wiseman, 2nd edn., Applied Science, London(1979).
5. Organic Chemicals in Perspective, Vols 1 and 2, H.A.Witteoff and B.G.Reuben, John Wiley, New York (1980)

6. Catalysis and chemical Processes, R.pearce and W.R.Patterson, Leonard Hill, Glasgow (1981).

7. From Hydrocarbons to petrochemicals, L.F.Hatch and M.Matar, Gulf Publishing, Houston (1981).

8. Petrchemicals, Dr.B.K.Roy.

BOOKS DEALING WITH SPECIFIC AREAS :

1. Modern Petroleum Technology, G.D.Hobson, 5th edn., John Wiley, Chichester (1984).

2. Our Industry Petroleum, The British Petrleum Company Ltd., 5th Edn., London (1977) chapter 12 - Crude Oil, Chapter 13 - refining; Chapter 18 - Na tural gas.

3. The Chemical Economy,B.G.Reuben and M.L.Burstall, Longman, London (1973). Chapter 15 - Process technology.

4. Ethylene and its Industrial Derivatives, S.A.Miller, Benn, London (1969).

5. Ethylene : Basic chemicals Feedstock Material, O.G.Farah, R.P.Oullette, R.C.JJuehnel, M.A.Muradaz and P.N.Cheremisinoff, Ann Arbor Science Publishers Inc., Ann Arbor Michigan (1980).

6. Pyrolysis :Theory and Industrial Practice, L.F.Albright, B.L.Crynes and W.H.Corcoran, Academic press, New York (1983).

7. Chemistry of Catalytic Processes, B.C.Gates, J.R.Gates,J.R.Katzer and G.C.A.Schuit, McGraw-Hill,New York (1979). Chapter 2 - ethylene oxide, vinyl acetate, Ziegler-Natta polymerisation, Oxo process, Chapter 3- Catalytic reforming, Chapter 4- Ccrylonitrite.

8. Proplylene and its Industrial Derivatives, E.G.Hancock, Benn,London (1973).

9. Benzene and its Industrial Dervatives,E.G.Hancock, Benn,London (1975).

10. Toluene, the Xylenes and their Industrial Derivatives, E.G.Hancock, Elsevier, Amsterdam (1982).

11. Catalyst handbook,Imperial Chemical Industries Ltd. Wolfe Scientific Books, London (1970). [Steam reforming and ammonia synthesis]

12. Chemicals from Synthesis Gas, R.A.Sheldon, B.Reidel Publishing Company, Dordrecht (1983) . [Includes a good discussion of the Oxo process.

LIST OF APPRATUS AND EQUIPMENTS REQUIRED FOR A BATCH OF TWENTY STUDENTS FOR B.SC.I,II & FINAL FOR PETROCHEMICAL SCIENCE.

Sr. No.	Name	Minimum Quantity Required
1.	Burette	20 Nos.
2.	Pipette 10 ml, 25 ml	20 Nos. each
3.	Mohr Pipette 2 ml, 5 ml,	10 Nos. each
4.	Conical Flasks with stoppers	50 Nos.
5.	Standard volumetric flasks	20 Nos.
6.	Density bottle	20 Nos.
7.	Balance (Electronics / Digital)	02 Nos.
8.	Aniline point apparatus	01 No.
9.	U-tube viscometers of different capillary size	02 sets
10.	Thermometer (0 to 110 0c IP Grade)	10 No.
11.	Thermometer (0 to 360 0c IP Grade)	06 Nos.
12.	Test tube (20 ml and 50 ml with rubber cork	50 Nos.
13.	Smoke point apparatus (IP Grade)	01 No.
14.	Abel Flash point Apparatus (IP Grade)	01 No.
15.	Pensky Martens Flash point Apparatus	01 No.
16.	Clevaland Open cup Flash point Apparatus	01 No.
17.	Poroceline Disc	10 Nos.
18.	Constant Temparature Bath	02 Nos.
19.	Hot plate	01 No.
20.	Air condensor	20 No.
21.	Glass tubing 6mm, 10mm	20 Ft. Each
22.	Glass rod 4mm, 8mm	20 Ft. Each
23.	Stop Watches	04 No.
24.	LPG Cylinder with regulator	01 No.
25.	Refractometer	01 No.
26.	Refrigerator	01 No.
27.	Water Distillation Plant	01 No.
28.	Beaker 250 ml	20 No.
29.	Beaker 50 ml, 100 ml, 500 ml, 1000 ml	7 No.each
30.	Hot air oven	1 No.
31.	Heating Furnace	1 No.

32.	Karl Fisher Autotitrator	1 No.
33.	Dean and Stark apparatus	1 No.
34.	Flame Photometer	1 No.
35.	Colorimeter	1 No.
36.	Bomb Calorimeter	1 No.
37.	Spectrophotometer	1 No.
38.	Oxygen Cylinder with pressure regulating valve	1 No
40.	Vacuum pump	1 No.
41.	Air source	1 No.
42.	Air flowmeter	1 No.
43.	Desiccators	6 Nos.
44.	Water Suction	4 Nos.
45.	Filtration Flask with buckner funnels	
	100 ml	6 Nos.
	250 ml	6 Nos.
	500 ml	3 Nos.
46.	Heating Mental	6 Nos.
47.	ASTM Distillation Apparatus	1 No.
48.	Viscometer and Constant temparature bath viscometer	1 set of
49.	Apparatus for oil determination in given sample As per IP norm	1 No.
50.	Dean and stark method	1 No.
51.	Reid vapour pressure apparatus with const. temp. bath	1 No.
52.	Ductility measuring meter	1 No.
53.	Penetrometer	
54.	Copper corrosion test apparatus	1 No.
55.	Cooling curve apparatus	1 No.
56.	Crankcase oil ditution apparatus	1 No.
57.	Thermometer as per IP norm for above apparatus and methods	2 Each
58.	Redwood viscometer No.I & No.II	1 No.each

(Note : All equipment and apparatus should be of IP standard.)

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12. PHYSICS.

The Examination in Physics comprises of three theory papers and a practical examination. Each theory paper will be of three hours duration and will carry 40 marks. The practical Examination will be of 6 hours duration and will carry 30 marks. The distribution of marks being :

The distribution of marks in practical examination is given as :-

Experiments (Two Experiments)	16 marks
Sessional work	05 marks
Viva-voce (3 for each experiment)	06 marks
*Co-curricular Activity Report	03 marks
Total :	30 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

A study/excursion tour to research, industrial and educational centres is essential in the University curriculum for B.Sc. students studying Physics.

Paper VII
(Relativity; Atomic, Molecular and Nuclear Physics)

Unit-I : Reference systems, Inertial frames, Galilean invariance and conservation laws, Michelson-Morley experiment. Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass energy equivalence, particle with zero rest mass.

Unit-II : Vector atom model, Stern-Gerlach experiment; quantum numbers, selection rules, l-s and j-j couplings.
Continuous X-ray spectrum and its dependance on voltage. Duane & Hunt's law, characteristic X-rays, Moseley's law, characteristics of X-rays spectra, X-ray absorption spectra.

Unit-III : Discrete set of electronic energies of molecules, quantisation of vibrational and rotational energies, determination of internuclear distance, pure rotational and rotation vibration spectra. Dissociation limit for the ground and other electronic

states, transition rules for pure vibrational and rotational spectra. Raman effect, stokes and anti-stokes lines, complementary characters of Raman and infrared spectra, experimental arrangement for Raman spectroscopy.

Unit-IV : Spectroscopic techniques : Sources of excitation, prism and grating spectrograph for visible, UV and IR, absorption spectroscopy, double beam instruments.
Interaction of charged particles and neutron with matter, working of nuclear detectors, GM counter, proportional counter and scintillation counter, Wilson cloud chamber.

Unit-V : Structure of nuclei, basic properties (I, μ,Q and binding energy), deuteron binding energy, p-p and n-p scattering and general concepts of nuclear forces; Alpha decay : range of α-particles, Geiger-Nuttal law, Gamow's explaination of α-decay. β–decay : types and Pauli's neutrino hypothesis.
Nuclear reaction : Compound nucleus, concept of liquid drop model, Fission and fusion (concepts only)

Reference Books :

1. Elements of Special Relativity - S.P.Singh, M.K.Bagde.
2. Relativistic Mechanics - Satya Prakash (Pragati Prakashan, Meerut)
3. Concepts in Physics, Vol. 1-Nadgowada/Patki/Kale/Soman/Gokhale
4. Introduction to Modern Physics - H.S.Mani, G.K.Mehta
5. Prospective of Modern Physics - A Beiser
6. Modern Physics - K.R.Balsubramanian (Himalaya Pub. House)
7. Concept of Modern Physics - S.L.Gupta, S.Gupta
8. Introduction to Atomic Physics - H.E.White
9. The Feymann Lecture series on Physics, Vol.3 - R.P.Feymann et.al.
10. Introduction to Molecular Physics - Barrow
11. Atomic Physics - J.B.Rajam
12. Atomic & Nuclear Physics - K.Gopalkrishnan
13. Atomic & Nuclear Physics - Brijlal, Subrahmanyam
14. Nuclear Physics - D.C.Tayal
15. Introduction to Nuclear Physics - H.A.Enge
16. Basic Nuclear Physics - B.N.Srivastava
17. Atomic & Molecular spectra-Rajkumar (Kedar Nath, Ram Nath, Delhi)
18. Nuclear Physics - R.C.Sharma
19. Nuclear Physics - I.Kaplan
20. Nuclear Physics - A.E.S.Green
21. Concept of Nuclear Physics - Bernard L.Cohen

Paper VIII
(Waves, Acoustics & Statistical Physics)

Unit-I : Wave motion, Energy transmission in waves, superposition & interference of sound waves, standing waves, velocity of longitudinal waves (Newton's formula), velocity of sound by Kundt's tube.
Velocity of transverse waves along a stretched string, harmonics, Chaldni's figures.
Reflection of sound, Echoes, refraction & diffraction of sound, sound ranging.

Unit-II : Ultrasonics, properties of ultrasonic waves, Piezo-electric & magnetostriction effect, production of ultrasonic waves by Piezo electric & magnetostriction oscillator, Detection of ultrasonic waves, acoustic grating, application of ultrasonic waves in medical science & industries.
Music & noise, characteristics of musical sound, human ear & its responses, limits of human audibility, measurement of intensity of sound (decibel & phon), musical scale & temperament.

Unit-III : Transducers (crystal microphone & moving coil loud speaker), Recording & reproduction of sound (magnetic tape, cine film & compact disc)
Acoustics of buildings, Reverberation & time of reverberation, Sabine's formula, Optimum reverberation, measurement of reverberation time, acoustic design, factors affecting the acoustics of buildings. Requisites for good acoustics.

Unit-IV : Phase space, unit cell, microstates, macrostates, energy states, density of energy states, probability and thermodynamic probability, principle of equal apriori probabilities, most probable distribution, Boltzman entropy relation.
Maxwell Boltzman statistics and its application to molecular speed distribution, average speed, rms speed and most probable velocities.

Unit-V : Distinguishable and indistinguishable particles, concepts of Bosons and Fermions. Bose-Einstein Statistics : Thermodynamic probability, most probable distribution. Application of Bose-Einstein statistics to black body radiation. Fermi-Dirac distribution : Thermodynamic probability, most probable distribution. Fermi function, Fermi energy and Fermi temperature.

Reference Books :

1. A text book of Sound - N. Subrahmanyam, Brijlal.
2. Sound - M.Ghosh
3. Waves & Oscillation - N. Subrahmanyam, Brijlal.
4. Text Book of Sound - Khanna & Bedi.
5. Text Book of Sound - Sharma & Saxena
6. Introduction to Statistical Physics - B.B.Laud
7. Statistical Mechanics by K.Singh & S.P.Singh
8. Statistical Mechanics - K.Haung
9. Statistical Physics - F.Relf
10. Physics of Vibrations & Waves - H.J.Pain

Paper IX
(Solid State Devices & Electronics)

Unit-I : Semiconductors : Intrinsic semiconductors, electrons and holes, Fermi level. Temperature dependence of electron and hole concentration. Doping, impurity states, n and p type semiconductors, conductivity, mobility, Hall effect, Hall coefficient.

Unit-II : Semiconductor devices : Metal - semiconductor junction, p-n junction, majority and minority carriers, diode as a circuit element, load line concept, rectification, power supply, C, L and π section filters, ripple factors, zener diode, voltage stabilization, IC-Voltage regulation, 78XX, 79XX, tunnel diode, light emitting diode.

Unit-III : Transistor : Structure, types, working modes; characteristics in CB, CE modes, current gain α, β and their relation, graphical analysis of CE amplifier, hybrid parameters, low frequency equivalent of CE amplifier and its analysis, Bias stability and thermal runaway - (Qualitative).

Unit-IV : Small Signal Amplifiers : General principles of amplifier classification, RC coupled amplifiers, equivalent circuits and gain at low, medium and high frequency (qualitative) gain-frequency response, emitter follower, input and output impedances, class A transformer coupled amplifier, Noise and distortion in electronic circuits.

Unit-V : Field effect transistors : JFET - construction and working, V-I curves, biasing of JFET, MOSFET: construction and working in depletion and enhancement mode.

Basic concept of difference amplifier, IC-OPAMP, electrical parameters of OPAMP, inverting and non-inverting modes, OP AMP as adder, substractor, integrator and differentiator.

Reference Books :

1. Solid State Electronic Devices - B.G. Streetman (Prentice-Hall)
2. Electronic Devices and circuits - Allen Mottershed
3. Electronic Devices, circuits and applications - W.D.Stanley
4. Electronic Principles - A.P.Malvino
5. Electronics Fundamentals and Applications - J.D.Ryder
6. Integrated Electronics - Millman, Halkias
7. Electronic Devices and Circuits - I and II - U.A. Bakshi, A.P.Godse
8. Elements of Electronics - M.K. Bagde, S.P.Singh
9. Basic Electronics -B.L.Theraja
10. Elements of Electronics - 5th Edition - 2002, Bagde & S.P.Singh, S.Chand Publication.
11. Electronic Devices and Circuits - 2nd Edition, Sanjeev Gupta, Dhanpatrai Publications, New Delhi.
12. OP-AMPS and Linear Integrated Circuits - 2nd Edition, Ramakant Gaikwad, PHI Publications.
13. Linear Integrated Circuits - Rao and Sutrawe (Nirali Prakashan, Pune)
14. Digital and Analog Techniques - 1st Edition, Navneet, Gokhale, Kale(Kitab Mahal), Nagpur.

B.Sc.-III (Physics Practical)

Every student will have to perform atleast 20 experiments from the following list. At the time of examination each student will have to perform 2 (Two) experiments.

1. Determination of Plank's constant using Photocell.
2. Determination of Plank's constant using Solar cell.
3. To determine "e" by Millikan's oil drop method.
4. To determine "e/m" by Helical method.
5. To determine "e/m" by Thomson's method.
6. To determine "e/m" by Magnetron method.
7. Determination of Rydberg's Method.
8. To study absorption spectrum of iodine vapours.
9. Study of Zeeman effect.
10. Study of Raman Spectrum.
11. To identify the element using optical line spectra.
12. To determine lattice parameter using X-ray diffraction pattern.
13. To determine half life period of radioactive substance by GM counter.

14. To determine coefficient of absorption of γ-rays/ α-rays.
15. To study hysterisis curve of transformer core.
16. Measurement of magnetic field by Hall-probe method.
17. To find band gap energy of semiconductor.
18. To determine characteristics of CE-transister.
19. To determine characteristics of CB-transister.
20. To determine frequency and phase by CRO.
21. To study R.C.Coupled amplifier.
22. To study of variation of gain of CE amplifier with load / frequency.
23. To study Zener / transister regulated power supply.
24. To study phase shift oscillator.
25. To study Weins bridge oscillator.
26. To study Hartley oscillator.
27. To study Colpit oscillator.
28. To determine characteristics of FET.
29. To study FET as a voltmeter.
30. Determination of a hybrid parameter of CE-transister.
31. To find conductivity of semiconductor at room temp. by Four Probe method.
32. Study of p-n diode as a rectifier.
33. Study of OP-AMP as inverting amplifier.
34. Study of OP-AMP as non-inverting amplifier.
35. Study of OP-AMP as an adder.
36. Study of OP-AMP as an integrator.
37. Study of OP-AMP as differentiator.
38. Study of OP-AMP as subtractor.
39. Study of I.C.-regulated power supply (Three-Terminal I.C.)

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Minimum requirement of apparatus for B.Sc. (PHYSICS) Calsses for a batch.

Sr. No.	Name of apparatus/Unit	Mainimum requirement
1.	Optical bench	1
2.	Research optical bench	1
3.	Convex lenses	4
4.	Bipirsm	1
5.	Prism	6
6.	Double image prism	2
7.	Sodium Lamps Complete	2

8.	Newton's ring apparatus		1
9.	diffraction grating		2
10.	Spectrometer		4
11.	Adjustable slits		4
12.	Microscope (Travelling) vertical Horizontal		4
13.	Telescope		4
14.	Potentiometer		2
15.	Resistance box --	1 - 500	3
		1 - 5000	3
		1 - 10,000	2
		Fractional	2
16.	Two way plug keys		5
17.	Rheostats		6
18.	Galvanometers		3
19.	Battery eliminator (Variable)		7
20.	Ammeter		4
21.	Voltmeter		4
22.	Multimeter		8
23.	Leclanche's cell		3
24.	Plug key		10
25.	Tap key		6
26.	Carry Foster's bridge		3
27.	Thermocouple		1
28.	Hot water bath		2
29.	Ballistic galvanometer		2
30.	Transformer		4
31.	Mercury Lamps		1
32.	Standard resistance - 1		2
33.	Charge - discharge dy for absolute capacity		1
34.	Inductances .	01 H	2
		5 H	2
35.	Oscillator (A. F.)		5
36.	Oscillator (R. F.)		2
37.	Connecting wire		1 kg.
38.	V.T.V.M.		5

39.	C.R.O.	1
40.	Dimerstate	1
41.	Fixed condenser	4
42.	Babinet compensator	
43.	Polarimeter	
44.	Bar pendulum	1
45.	Stop watches	6
46.	Meter Scale	6
47.	G. clamps	4
48.	Knife edges	4
49.	Metal bars	3
50.	Vernier callipers	3
51.	Maxwell's needle for 'n' apparatus	1
52.	Ring disc (Dynamics) apparatus	1
53.	Poisullie's flow apparatus complete	1
54.	Thermometers 0 - 1100	5
55.	Steam traps (glass)	4
56.	Stands	5
57.	Weight boxes	6
58.	Helmholtz resonator	1
59.	Tunning forks set	1
60.	Frequency of A.C. mains apparatus	1
61.	Measuring cylinders 200 ml.	2
62.	Thomon's tube for e/m	1
63.	Milikan's apparatus	1
64.	X- ray diffraction pattern b c c powder	1
65.	Study board of power supply	1
66.	Study board of wein's bridge oscillator	1
67.	G.M. counter experiment set	1
68.	Study board of half adder/ full adder	1
69.	Study board of logic gates	1
70.	Study board of "Characteristics of Phototransistor"	1
71.	Study board of NOR gates and switching characteristics	1

72.	Study board of NAND gate and switching characteristics	1
73.	Study board of Sequential logic FF	1
74.	Study board of Sequential logic RS FF	1
75.	Study board of Sequential logic C RSFF	1
76.	Study board of Sequential logic J K FF	1
77.	Sutdy board of Op-Amp as differentiater	1
78.	Study board of Op-Amp as an integrator	1
79.	Study board of Op-Amp as an inverting amplifiers	1
80.	Study board Op-Amp as an Non-inverting amplifiers.	1
81.	Study of monostable mulitvibrator	1
82.	Study of bistal multivibrator	1
83.	Study of Astable multivibrator	1
84.	Study of MOPA	1
85.	Study of VHF oscillator	1
86.	Study of diode detector	1
87.	Study of amplitude modulator	1
88.	Study of TRF receiver	1
89.	Study of super herrodyne receiver	1
90.	Digital power supply (Dual type) +15 to-15	1
91.	P-N-diode	2
92.	Apparatus of I-H curve	1
93.	Study board for diode as rectifier	1
94.	Study board for Thevinin's theorem	1
95.	Study board for Millman's theorem	1
96.	Study of Activation energy of thermister	1
97.	Study board owen's bridge	1
98.	Study board for maximum power transfer theorem	1
99.	'Y' by bending apparatus	1
100.	Thermal conductivity of rubber tube cyparatus	1
101.	'n' by stastical method apparatus	1
102.	Keler's Pendulum	1
103.	Zener Diode expt.set	1
104.	Set for study of Star Delta Transformation	1

105.	Study of Multirange Voltmeter	1
106.	Study of Multirange ammeter	1
107.	Study of Series and Shunt Ohmmeter	1
108.	Screw Guage	3
109.	Study of Phase Shift Oscillator	1
110.	Study of Crystal Controlled Oscillator.	1
111.	Plank's Constant Apparatus	1
112.	'e/n' by Thomson's Apparatus	1
113.	Four Probe Apparatus.	1
114.	Crystal Models to Study Point Symmetry	1

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13. CHEMISTRY

(Effective from the Session 2005-2006)

There shall be following papers and practicals for B.Sc.Part-III examination.

There shall be three compulsory papers in theory as stated below and practical examination extending for 6 hours. Every examinee shall offer the following three papers of 40 marks each and practical examination of 30 marks.

1)	Paper-VII :	Inorganic Chemistry	40 Marks
2)	Paper-VIII :	Organic Chemistry	40 Marks
3)	Paper-IX :	Physical Chemistry	40 Marks
	Practical :		30 Marks
		Total :	150 Marks

The practical examination will be in the above three Branches of Chemistry. The Distribution of marks shall be as follows.

a)	Inorganic Chemistry (Exercise)	07 Marks
b)	Organic Chemistry (Exercise)	07 Marks
c)	Physical Chemistry (Exercise)	07 Marks
d)	Record	03 Marks
e)	Viva	03 Marks
f)	*Co-curricular Activity report	03 Marks
	Total :	30 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

** Study tour : Compulsory Visit to any industry or research laboratory and submission of detail report.

Paper-VII
(Inorganic Chemistry)

Total Lectures : 60 **Marks : 40**

Note : Figures to the right hand side indicates number of Lectures.

UNIT I COORDINATION COMPOUNDS - I [12]

A] Important terms namely molecular or addition compounds, double salts, complex salts, complex ion. Werner's theory of coordination and its experimental verification on the basis of conductance data and formation of AgCl precipitate in case of cobaltammines. Sidgwick's electronic interpretation, effective atomic number. IUPAC rules for nomenclature of coordination compounds. Isomerism in coordination compounds namely ionization, linkage, coordination, geometrical and optical isomerism. Valence bond theory of structure and bonding in complexes of metal ions of 3d-series elements. Concept of hybridization and application of magnetic moment data for 3d-metal complexes. Inner and outer orbital complexes. Limitations of VB theory.

UNIT II COORDINATION COMPOUNDS - II

A] Crystal Field Theory : [6]

Elementary idea about CFT, Crystal field spliting in octahedral, tetrahedral, tetragonally distorted octahedral and square planar complexes. Factor affecting magnitude of crystal field splitting in octahedral complexes. Distribution of electrons in t_{2g} and eg orbitals in octahedral field, concept of CFSE, high spin and low spin complexes on the basis of Δ_0 and pairing energy.

B] Electronic Spectra of Transition Metal Complexes : [6]

Introduction to spectra, types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states,term symbols, calculation of ground terms. Spectra of d^1 and d^9 octahedral complexes, orgel diagram for d^1 and d^9 states. Discussion of

electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion. Spectrochemical series.

UNIT III COORDINATION COMPOUNDS - III

A] Chelates : [2]

Definition, classification and applications of chelates in analytical chemistry.

B] Stability of Complexes : [4]

A brief idea of thermodynamic stability of metal complexes and factors affecting stability of complexes.

C] Kinetic Aspects of Metal Complexes : [6]

Types of reactions of coordination compounds, brief idea about substitution reactions, SN^1-dissociative and SN^2-associative mechanism. Labile and inert complexes. Factors affecting lability of complexes namely arrangement of d-electrons (on the basis of VB theory), size of central metal ion, charge of central metal ion, geometry of complexes. Substitution reactions in square planar complexes-mechanism.

UNIT IV

A] Organometallic Chemistry : [6]

Definition, nomenclature and classification of organometallic compounds. A brief account of metal-ethylenic complexes-Structure and bonding and applications in homogeneous catalystic reaction (hydrogenation). Mononuclear carbonyls : preparation, properties, structure and bonding in $Ni(CO)_4$, $Fe(CO)_5$, $Cr(CO)_6$. Nature of M-C bond in metal carbonyls.

B] Inorganic Polymers : [6]

Definition and classification. Silicones : preparation, characteristics and applications. Phosphazenes-preparation, properties, applications of phosphonitrile halides. Structure and bonding in triphosphazenes.

UNIT V

A] Bio-inorganic Chemistry : [4]

Essential and trace elements in biological processes. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}, Mg^{2+}, Na^+ and K^+ ions. Metalloporphyrins with special reference to

haemoglobin and myoglobin. Nitrogen fixation.

B] Analytical Chemistry :

1) *Spectrophotometry and Colorimetry* :- [4]

Concept of λ_{max}, Beer-Lambert's law, validity of Beer's law, Limitations of Beer's law, verification of Beer's law. Block diagram of colorimeter and spectrophotometer with names and purpose of each component. Difference between colorimetric and spectrophotometric technique for determination of concentration of metal ion.

2) *Paper Chromatography* :- [4]

Definition and classification of chromatographic techniques. Principle of differential migration. Principle and technique of paper chromatography -ascending, discending and circular Rf value and factors affecting Rf value.

Paper-VIII

(Organic Chemistry)

Total Lectures : 60 Marks : 40 .

UNIT I HETEROCYCLES AND ORGANOMETALLICS

A] Heterocycles : [8]

Introduction, 5 and 6 - membered heterocycles, orbital picture of pyrrole, furan and thiophene and pyridine. Modern methods of synthesis. Electrophillic substitution in pyrole, furan, thiophene and pyridine. Chemical reactivity and orientation. Nucleophilic substitution in pyridine.

B] Organometallic Compounds : [4]

Introduction, methods, preparations and synthetic applications of organo-magnesium, organolithium and organozinc compounds.

UNIT II POLYMERS, DYES AND DRUGS

A] Polymers : [5]

Introduction, types of polymers, addition and condensation polymers. Manufacture and applications of,

1] Natural and synthetic rubber (Buna-3 and Buna-N).

2] Synthetic fibres : polyamides, polyesters and polyacrylates.

3] Plastics : Polyolefins and polyurethanes.

B] Dyes : [5]

Classification of dyes on the basis of structures, and on the basis of mode of application. Preparation and uses of methyl orange, congo red, crystal violet and alizarin.

C] Drugs : [2]

Introduction, preparation,drug action and uses of aspirin, paracetamol, sulphanilamide and sulphaguanidine.

UNIT III SPECTROSCOPY - I

A] Electronic Spectroscopy : [6]

Introduction, radiation source, spectral range, types of electronic transitions, chromophore, auxochrome, bathochromic, hypsochromic, hypochromic and hyperchromic effects. Presentation of spectrum, application to structure determination of compounds like dienes, aldehydes, ketones and aromatic systems.

B] Infra-Red Spectroscopy : [6]

Vibrational molecular motions, Hooke's law, selection rules, vibrational energy, lowest allowed vibrational states, types of vibrational modes, stretching and bending, spectrum range, radiation source, presentation of IR spectrum. Characteristic frequencies of various groups, finger print region. Structure of organic compounds. (IR spectra of simple compounds : H_2O, CO_2, $CH \equiv CH$, CH_3COCH_3).

UNIT IV SPECTROSCOPY - II

A] Nuclear Magnetic Resonance Spectroscopy : [7]

Introduction, origin of NMR phenomenon, spins of nucleus, spin angular momentum for hydrogen, energy states for proton in magnetic fields, absorption signals in spectrum, number of signals, equivalent and non- equivalent protons, nuclear shielding and deshileding chemical shift, delta scale, integration wave, peak area and proton counting, spin-spin splitting, NMR spectra of simple molecules and structural analysis (ethyl bromide, ethyl alcohol, acetal dehyde 1,1,2-tri bromoethane, ethyl acetate, toluene and acetophenone, acetone.)

B] Mass Spectrometry : [5]

Introduction, theory, measurement technique (EI, CI FD, FAB), recording of mass spectrogram, types of ions produced in mass spectrogram, types of ions produced in mass spectrometer. Exact

masses of nucleotides, molecular ions, isotope ions, fragment ions. Determination of molecular formula on the basis of mass spectra.

UNIT V

A] Isolation, Extraction and Purification of Organic Compounds : [6]

Extraction, Soxhlet extraction, solvent extraction, distillation, simple, fractional, steam and under reduced pressure. Sublimation, crystallization, Paper chromatography, principle and Rf value.

B] Estimation of elements (C, H, N, S and X) determination of molecular weight of organic acids by silver salt method and that of bases by platinum salt method and volumetric methods, (Only principle and calculations), empirical formula, molecular formula, problem involving calculations,reactions and spectral data. **[6]**

Paper-IX

(Physical Chemistry)

Total Lectures : 60 **Marks : 40**

UNIT I ELEMENTARY QUANTUM MECHANICS [12]

Black body radiation, Plank's radiation law, photoelectric effect, heat capacity of solids, compton effect, de-Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Schrodinger wave equation and its importance, Physical interpretation of wave function, postulates of quantum mechanics, Hamiltonian operator, particle in a one dimensional box. Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions, numerical problems.

UNIT II SPECTROSCOPY [12]

Introduction :

Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers with their block diagram, statement of Born- Oppenheimer approximation, degree of freedom.

Rotational Spectrum :

Diatomic molecules, Energy levels of a rigid rotor (semi-classical principles), selection rules, origin of spectral lines, spacing between spectral lines of diatomic rigid rotor, determination of moment of inertia and bond length, isotope effect.

Vibrational Spectrum :

Infrared spectrum, Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum intensity, determination of force constant and qualitative relation of force constant and bond energies.

Raman Spectrum :

Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules. Numerical problems.

UNIT III PHOTOCHEMISTRY [12]

Interaction of radiation with matter, difference between thermal and photochemical processes, Laws of photochemistry, Grothus-Drapper law, Stark-Einstein law, Jablonski diagram depicting various processes occuring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, inter- system crossing), quantum yield, experimental determination of quantum yield, reasons for high and low quantum yield, photosensitized reactions- energy transfer processes (simple examples). Kinetics of photochemical decomposition of hydrogen iodide, Numerical problems.

UNIT IV ELECTROCHEMISTRY [12]

Types of reversible electrodes - gas-metal ion, metal-metal ion, metal-insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell EMF and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements, computation of cell EMF, calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), polarisation, over potential and hydrogen over voltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations. Definition of pH and pKa, determination of pH using hydrogen, quinhydrone and glass electrodes by potentiometric method. Numerical problems.

UNIT V NUCLEAR CHEMISTRY [12]

Fundamental particles of nucleus, Shell model-assumptions,

evidence of magic numbers, applications and limitations. Liquid drop model (qualitative ideas), Meson theory of nuclear forces, classification of nuclear reactions. Calculations of Q value of nuclear reactions. Nuclear fission and fussion, fission yield, fission yield curve, Applications of radioactive isotopes in industry, agriculture, medicine and biochemistry. Brief ideas of radiation hazards, management of nuclear waste. Numerical problems.

B.Sc. Part III
Practical
INORGANIC CHEMISTRY PRACTICALS

A] Inorganic Synthesis (Preparations) :

This exercise is not for examination. At least 4 preparations are to be done from the following. Samples of the compounds are to be submitted at the time of practical examinations.

1] Preparation of sodium trioxalato ferrate (III) i.e. $Na_3[Fe(C_2O_4)_3]$.
2] Preparation of copper-tetramine complex i.e. $[Cu(NH_3)_4]SO_4$.
3] Preparation of Ni^{2+}-DMG complex.
4] Preparation of Cis and trans-bisoxalatodiacua chromate (III) ion.
5] Preparation of hexamine nickel (II) chloride.
6] Preparation of potassium trisoxalatoaluminate (III).
7] Preparation of chrome alum.
8] Preparation of Prussiun blue from iron filings.
9] Preparation of sodium thiosulphate.

B] Volumetric Analysis :

Following two exercises are compulsory (and for examination).

1] Estimation of copper using thiosulphate (iodometry).
2] Estimation of Zn^{2+} by complexometric titration.

Any four exercises are to be done from the following. This is not for examination. A special project report of any one exercise is to be submitted at the time of practical examination.

1] Determination of acetic acid in commercial vinegar using NaOH.
2] Determination of alkali content in antacid tablet using HCl.
3] Determination of composition of the complex $Na_3[Fe(C_2O_4)_3]$ by permanganometry.

4] Estimation of hardness of water by EDTA.

5] Estimation of calcium content of chalk as calcium oxalate by permanganometry

6] Estimation of Ca^{2+} and Mg^{2+} content of soil by complexometric titrations.

Note :- In all these exercises, students are expected to prepare standard solutions required.

ORGANIC CHEMISTRY PRACTICALS

A student is expected to perform at least 10 to 12 estimations from the following list;

1] Estimation of acetamide.

2] Estimation of glucose.

3] Estimation of glycine.

4] Estimation of ascorbic acid.

5] Estimation of amino group.

6] Estimation of formaldehyde.

7] Determination of equivalent weight of an acid.

8] Determination of iodine value of an oil.

9] Determination of equivalent weight of an ester by saponification.

10] Determination of saponification value of an oil.

11] Estimation of nitro group.

12] Estimation of protein.

13] Estimation of free fatty acids in oil.

14] TLC/paper chromatography : Qualitative separation of mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).

15] Chromatographic separation of 2, 4 DNP derivative of acetone and butanone-2 using toluene-petroleum ether (40:60).

PHYSICAL CHEMISTRY PRACTICALS

1] To determine the strength of the given acid conductometrically using standard alkali solution.

2] To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically.

3] To determine ionisation constant of a weak acid conductometrically.

4] To determine the strength of the given acid potentiometrically using standard alkali solution.

5] To titrate potentiometrically the given ferrous ammonium sulphate solution using $K_2Cr_2O_7$ / $KMnO_4$ as titrant and calculate the redox potential of Fe^{2+} | Fe^{3+} system on the hydrogen scale.

6] To determine the specific rotation of a given optically active compound.

7] To verify Beer-Lambert law for $KMnO_4$ / $K_2Cr_2O_7$ / $CuSO_4$ and determine the concentration of the given solution of the substance.

8] To determine the pH of soil & tap water sample by pH meter technique.

9] To titrate phosphoric acid with standard solution of sodium hydroxide and determine the redox potential constant using pH meter.

Books suggested (Theory Courses).

1) Basic Inorganic Chemistry, F.A.Cotton, G. Wilkinson and P.L.Gaus, wiley.

2) Concepts of models of Inorganic Chemistry, B.Duglus, D.McDonial and J.Alexander, John Wiley.

3) Inorganic Chemistry, D.E.Shriver, P.W.Atkins and C.H.Langford, Oxford.

4) Inorganic Chemistry, W.W.Porterfield Addison Wisley.

5) Inorganic Chemistry, A.G.Sharpe, ELBS.

6) Inorganic Chemistry, G.L.Miessler and D.A.Tarr, Prentice Hall.

7) Organic Chemistry, Morrison and Boyd, Prentice Hall.

8) Organic Chemistry, L.G.Wade Jr.Prentice Hall.

9) Fundamentals of Organic Chemistry, Solomon's John Wiley.

10) Organic Chemistry, F.A.Carey, McGraw Hill, INC.

11) Introduction to Organic Chemistry Streitwieser, Heathcock and Kosover, McMillan.

12) Physical Chemistry, J.M.Baro, International Student Edition, McGraw Hill.

13) Basic Programming with application, V.K.Jain, Tata McGraw Hill.

14) Computer Science Common Sense, R.Hant and Shelly, Prentice Hall.

15) University General Chemistry, C.N.R.Rao, Macmillan.

16) Physical Chemistry, R.A.Alberty, Wiley Eastern Limited.

17) The Element of Physical Chemistry, P.W.Atkins, Oxford.

18) Physical Chemistry through problem, S.K.Dogra and S.Dogra, Wiley Eastern Limited.

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Books recommended for paper-VII(Inorganic Chemistry)

1. Principle of Inorganic Chemistry - by Puri, Sharma and Kalia S.Naginchand & Co. Delhi.
2. Text book of Inorganic Chemistry by A.K.De, Wiley East. Ltd.
3. Selected topics in Inorganic Chemistry by Malik,Tuli and Madan S. Chand & Co.
4. Modem Inorganic Chemistry by R.C.Agrawal, Kitab Mahal.
5. Instrumental methods of analysis by Chatwal & Anand, Himalaya Publishing house.
6. Concise Inorganic Chemistry by J.D.Lee - Elbs.
7. Inorganic Chemistry by J.E. Huheey - Harper & Row.
8. Fundamental concepts of Inorganic Chemistry by E.S.Gilreath.Mcgraw Hill book Co.
9. Modern Inorganic Chemistry by W.L.Jolly-Mcgraw Hill Int.
10. Chemistry Facts, Patterns & Principles by Kneen, Rogers & Simpson - Elbs.
11. Theoretical Principles of Inorganic Chemistry by G.S.Mankutata Mcgraw hill.
12. Inorganic Complex Compound by Murmann-Chapman & Hall.
13. Text book of Inorganic Chemistry by K.N.Upadhyaya, Vikas Publishing house Delhi.
14. Advance practical Inorganic Chemistry by Gurdeep Raj, Goel Publishing house Meerut.
15. Co-ordination Chemistry by D.Banerjee, TMH Publication.
16. Inorganic Chemistry by B.J.Joshi,P.J.Bahad, S.R.Mandlik, R.M.Kedar, C.B.Deshpande,V.V.Parhate published by Amravati University Chemistry Teachers Association with Bokey Prakashan,Amravati.

Books recommended for Paper VIII (Organic Chemistry)

1. Organic Chemistry by R.T.Morrison & R.N.Boyd; 6th Edn. PHI
2. Organic Chemistry by Pine 5th Edn.
3. Organic Chemistry Vol.I,II and III by Mukharjee, Singh and Kapoor - Wiley Eastern. (New Age International)

4. Organic Chemistry by S.K.Ghosh.
5. Reaction Mechanism in Organic Chemistry by S.M.Mukharjee and S.P.Singh.
6. Spectroscopy of Organic Compounds by P.S.Kalsi
7. Stereochemistry & Mechanism through Solved Problems by P.S.Kalsi.
8. Organic Chemistry by Twg Solomons 4th edn. John Wiley.
9. Hand book of Organic Analysis by H.T. Clarke, Arnold Heinmen.
10. Text book of Practical Organic Chemistry by A.I.Vogel.
11. Organic chemistry by P.R.Rajput, S.N.Bhosale, Y.K.Meshram, V.G.Thakare, Dr.S.P.Deshmukh,A.R.Mankar published by Amravati University Chemistry Teachers Association with Bokey Prakashan, Amravati.
12. Text Book of Organic Chemistry by P.S. Kalsi Published by Macmillan India Ltd. 1999, Delhi.
13. Practical Organic Chemistry by F.G.Mann, B.C.Saunders O.L.
14. Comprehensive Practical Org.Chem. (Qualitative Analysis) by V.K.Ahluwalia, Sunita Dhingra Orient Longman.
15. Comprehensive Practical Org.Chem. (Preparation and Qualitative Analysis) by V.K.Ahluwalia, Renu Agrawal Orient Longman

Books recommended for paper IX (Physical Chemistry)

1.	Physical Chemistry	:	Walter, J.Moore, 5th edn.New Delhi.
2.	Physical of Physical Chemistry	:	G.M.Barrow, Magraw Hill,Indian Edn.
3.	Principles of Physical Chemistry	:	Maron and Prutton.
4.	Principles of Physical Chemistry	:	Puri & Sharma.
5.	Physical Chemistry	:	P.W.Atkins 4th edn.
6.	Text book of Physical Chemistry	:	P.L.Sony, O.P.Sharma.
7.	Physical Chemistry	:	Levine.
8.	Practical Physical Chemistry	:	Palit and De.
9.	Practical Physical Chemistry	:	Yadao.
10.	Practical Physical Chemistry	:	Khosla.
11.	Laboratory Manual of Physical Chemistry	:	W.J.Opplel.

12.	Practical Chemistry	:	Dr.S.B.Lohiya
13.	Physical Chemistry	:	S.B.Phadke, G.N. Chaudhari, S.S.Kabra, R.G.Bhangale, A.B.Patil, S.K.Rithe published by Amravati University Chemistry Teacher Association with Bokey Prakashan, Amravati.
14.	Practical Chemistry	:	Dr.A.S.Aswar, R.G.Rohankar, S.K.Bhagat published by Amravati University Chemistry Teachers Association with Bokey Prakashan, Amravati.
15.	Analytical Chemistry	:	Dr.G.L.David Krupadanam, D.Vijaya Prasad, K.Varaprasad Rao,KLN Reddy, C.Sudhakar.

List of equipments / Apparatus required for the Chemistry Practicals for B.Sc.

1.	Abbe's refractometer	2 nos./batch
2.	Viscometer	10 nos./batch.
3.	Stalagmometer	10 nos./batch
4.	Melting point apparatus	10 nos./batch
5.	Thermometer 0 to 360 ^{0}c.	20 nos./batch
6.	Thermometer 0 to 110 ^{0}c.	20 nos./batch
7.	Analytical balance	15 nos./batch
8.	Weight box	15 nos./batch
9.	Density bottle	20 nos./batch
10.	Kipp's apparatus	02 nos./batch
11.	Quick fit distillation assembly/ Multipurpose assembly	10 nos./batch
12.	Sintered glass crucible	20 nos./batch
13.	Silica crucible	20 nos./batch

14.	Vacuum suction pump	02 no./lab.
15.	Potentiometer	02 nos./batch
16.	Electronic one pan balance	01 no./lab.
17.	Filtration flasks with buckner funnels	
	100 ml.	10 nos./batch
	250 ml.	05 nos./batch
	500 ml.	02 nos./batch
18.	Descicators	10 nos/batch
19.	Magnetic stirrer	10 nos/batch
20.	Water suction	10 nos/batch
21.	Conductometer with conductivity cell	04 nos/batch
22.	Colorimeter	02 nos./batch
23.	pH-meter	02 nos./batch
24.	Chromatographic jar	05 nos./batch
25.	Separating funnels 250 ml,500 ml.	05 each/batch
26.	Hot air oven	02 no./lab
27.	Hot cold air blower	01 no/lab
28.	Centrifuge machine (Electrically operated)	02 no/lab
29.	Deioniser/water still (Electrically operated)	01 no./lab
30.	Hot plate/heating mantle	05 no./batch
31.	Models of elements(Seven cryst. types and their symmetry)	
32.	Flame photometer	01 no/batch
33.	Spectrophotometer	02 nos/batch
34.	Shaking machine	01 no/batch
35.	Polarimeter	02 nos/batch

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14. BOTANY

(Effective from the session 2005-06 & onwards)

The syllabus is based on six lectures and two practicals each of three periods duration per week. The examination shall comprise of three theory papers and a practical. Each theory paper shall be of three hours duration and carry 40 marks each.

The practical shall be of 4 hours duration and carry 30 marks.

PAPER-VII
PLANT PHYSIOLOGY

Unit-I : Plant Water Relations -

A - Physical Properties of water.
- Importance of water to plant life.
- Diffusion, Osmosis, Plasmolysis.

B - Absorption of water.
- Transport of water.

C - Transpiration - Stomatal mechanism, Factors and significance. Guttation.

D - Mineral absorption.

Unit-II : Plant Metabolism -

A - Photosynthesis-
Introduction, photosynthetic apparatus, photosynthetic pigments, concept of two pigment systems, Role of light, Photo-phosphorylation, Calvin's cycle, C_3-plants, C_4 plants, C_4-pathway, CAM pathway, CAM-plants, photorespiration and its significance.

B - Translocation of organic solutes.
Mechanism of phloem transport, source- sink mechanism.

Unit -III : Respiration -

Introduction, mitochondrion as a respiratory centre.
Types of respiration - Aerobic and anaerobic respiration, Mechanism of aerobic respiration.
Electron Transport mechanism (chemiosmotic theory)
Respiratory quotient.
Pentose Phosphate pathway.

Unit-IV : Plant Metabolism -

A - Nitrogen Metabolism.
Sources of Nitrogen, Biological nitrogen fixation.
Importance of Nitrate reductase and its regulation.

B - Lipid Metabolism.
Structure and functions of lipids, β-oxidation.

C - Mineral Nutrition.
Essential macro and micro elements and their role, deficiency and toxicity symptoms, Hydroponics.

Unit-V : Growth and Development -

A - Growth
Definition, phases of growth.
Seed dormancy - Definition, factors.

B - Plant Movements - Broad Classification, seismonastic movement.

C - Physiology of flowering - Photoperiodism, concept of florigen and phytochromes.

D - Plant Hormones - Auxins, Gibberellins, Cytokinins, Abscisic acid, Ethylene - Discovery, their practical applications.

E - Ripening of fruits and concept of senescence.

PAPER-VIII
CELL BIOLOGY AND GENETICS

Unit-I : Cell Biology -

(a) The Cell Envelopes : Cell wall - structure & functions; Plasma membrane - Bilayer lipid structure; functions.

(b) Cell organelles - Structure and functions of Golgi complex, E.R., Peroxisomes, Vacuoles, Ribosomes, Mitochondria, Chloroplast.

Unit-II : Cell Biology -

(a) Nucleus - Ultrastructure; nuclear membrane, nucleolus; functions.

(b) Chromosome organization :- Morphology, centromere and telomere; sex-chromosomes.

(c) Cell division :- Mitosis and Meiosis.

Unit-III : Genetics -

(a) Chromosome aberrations :- Deletions, duplications, translocations, inversions.

(b) Variations in chromosome number - Aneuploidy, Polyploidy.

Unit-IV : Genetics -

(a) Mendelism - Mendel's laws of segregation and independent assortment.

(b) Interaction of genes - Lethal, Complementary, Supplementary and Epistasis.

(c) Problems based on Mendelism and interaction of genes.

Unit-V : Genetics-

(a) Linkage - Concept, types and theories of linkage.

(b) Gene Mutations : Spontaneous and induced.

(c) Extranuclear genome - Presence and functions of mitochondrial and plastid DNA; Plasmids.

PAPER-IX
BIOCHEMISTRY, BIOTECHNOLOGY AND GENETIC ENGINEERING

Unit-I : Basics of Enzymology-

Discovery and nomenclature; Characteristics of enzymes; concept of holoenzyme, apoenzyme, coenzyme and cofactors; regulation of enzyme activity; Mechanism of action.

Unit-II : DNA the genetic material :

DNA structure, replication; DNA-protein interaction; the nucleosome model; genetic code; satellite and repetitive DNA.

Unit-III : Gene Expression -

Concept of gene, transfer of genetic information, transcription, translation, protein synthesis, tRNA, ribosomes, regulation of gene expression of prokaryotes and eukaryotes; proteins 1D, 2D and 3D structure.

Unit-IV : Genetic Engineering -

Tools and techniques of recombinant DNA technology, cloning vectors; genomic and c-DNA library, transposable elements; techniques of gene mapping and chromosome walking.

Unit-V : Biotechnology -

Functional definition; basic aspects of plant tissue culture; cellular totipotency, differentiation and morphogensis; biology of *Agrobacterium*, vectors for gene delivery and marker genes; salient achievements in crop biotechnology.

BOTANY PRACTICAL

1) Plant Physiology (Major) (Any seven)

i) To study the effect of temperature and alcohol on permeability of plasma membrane.

ii) Seperation of chlorophyll pigments by solvent / paper chromatography method.

iii) To compare the rate of transpiration from two surfaces of a leaf by Bell Jar method.

iv) To study osmotic pressure of cell sap by plasmolytic method.

v) Comparative rate of photosynthesis under variable conditions of CO_2 concentration and light (Quality, Intensity) (Wilmotts-bubbler)

vi) To study antagonism of salts.

vii) To determine R.Q. using different substrates.

viii) Seperation of amino acids in a mixture by paper chromatography.

ix) To determine the path of water (ascent of sap)

x) To study phenomenon of adsorption.

2) Minor Physiology Experiments (Any three)

i) To demonstrate fermentation.

ii) To demonstrate exo and endosmosis.

iii) To demonstrate that light is necessary for photosynthesis. (Ganong's light screen)

iv) To demonstrate anaerobic respiration in germinating seeds.

v) To demonstrate the evolution of CO_2 in respiration.

vi) To demonstrate the phenomenon of nastic movement with help of *Mimosa pudica* / or *Biophytum sensitivum.*

3) Cytology

i) Squash / Smear preparation for cell divisions.

ii) Fixation and staining of mitochondria and salivary gland chromosomes.

4) Biochemistry (Any four)

i) To study the enzyme activity of catalase.

ii) To demonstrate test for glucose in grapes, & sucrose in canesugar / beet root.

iii) To demonstrate test for protein.

iv) To demonstrate the activity of enzyme papain (on egg albumin)

v) To demonstrate the lipid test in oily seeds.

vi) To demonstrate the test for starch / cellulose.

vii) To demonstrate the activity of enzyme amylase from germinating Wheat grains.

5) Genetics

i) To prove Mendel's Monohybrid ratio.

ii) To prove Mendel's Dihybrid ratio.

6) Biotechnology (Any Two)

i) To demonstrate the percentage of germination of seeds / pollen

grains / fungal spores.

ii) To demonstrate the percentage of heterocyst in a given Cyanobacteria.

iii) Isolation of protoplast from different tissues using commercially available enzymes.

iv) Demonstration of the technique of anther culture.

v) Extraction of DNA.

PRACTICAL EXAMINATION

Time : 4 hours. Marks : 30

Que.1 :	To perform given major physiology experiment	6 Marks
Que.2 :	Comment on minor physiology experiment	2 Marks
Que.3 :	Squash / smear preparation (for Mitosis/Meiosis)	4 Marks
Que.4 :	Biochemistry : To perform given experiment.	4 Marks
Que.5 :	Biotechnology : To perform given experiment.	4 Marks
Que.6 :	Genetics : To perform given experiment.	4 Marks
Que.7 :	Class record/ and viva-voce	3 Marks
Que. 8:	*Co-curricular Activity Report	3 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

Books Recommended :

1) Amar Singh 1967 : Plant Physiology
2) H.N.Shrivastav : Plant Physiology
3) Pradip's Botany Vol. V, Biochemistry and Biotechnology- New Millenium Edition
4) P.L.Kocchar : Plant Physiology
5) V.Verma : Plant Physiology
6) Purekar and Singh : Plant Physiology
7) Kocchar P.C. : T.B. of Plant Physiology
8) Salisburry & Ross : Plant Physiology
9) Devlin R.M. : Plant Physiology
10) C.P.Malik : Plant Physiology
11) Mayer & Anderson : Plant Physiology
12) Curtis & Clark : Introduction of Plant Physiology
13) Mr./Mrs.Pillei : Plant Physiology
14) Galston, A,.W. 1989. Life processes in plants. Scientific American Library, Springer-Verlag, New York.

15) Hopkins, W.G. 1995 : Introduction to Plant Physiology. John Wileys & Sons, Inc, New York, U.S.A.
16) Mohr, H. and Schopfer, P. 1995 : Plant Physiology c4th : Edition, Wordsworth publishing Co. California, U.S.A.
17) Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Edition) Wordsworth Publishing Co. California, U.S.A.
18) Taiz, Land Zeiger, E. 1998. Plant Physiology (2nd Edition) Sinauer Associates, Inc, Publishers, Massachusetts, U.S.A.
19) Veerbala Rastogi : Introduction to cytology.
20) P.S.Verma & Agrawal V.K. : T.B. of Cytology.
21) De-Robertis EDP : Cell Biology.
22) Dalela & Verma : Cytology.
23) P.K.Gupta : Cytogenetics & Evolution.
24) Shukla & Chandel : Cytogenetics, Evolution & Plant Breeding.
25) Langely : Cell Structure & Functions.
26) Rastogi : Cell Biology.
27) Alberts, B.Bray, D.Lewis, J.Raff, M.Roberts, K. and Watson, I.D. 1999. Molecular Biology of Cell - Garland Publishing Co. Inc New York, U.S.A.
28) Gupta, P.K. 1999 : A Text book of Cell and Molecular Biology, Rastogi Publication, Meerut, India.
29) Wolfe, S.L. 1993. Molecular and Cell Biology. Wordsworth Publishing Co., California, U.S.A.
30) Gunning, B.E.S. and Steer, M.W. 1996. Plant Cell Biology : Structure and function. Jones and Bartlett Publishers, BOSTON, Massuchusetts.
31) Sinnott Dunn & Dobzansky : Principles of Genetics.
32) Gardiner : Principles of Genetics.
33) W.D.Stanfield : Theory and Problems of Genetics.
34) Atherly, A.G.Girton, J.R. and McDonald, J.F. 1999. The Science of Genetics. Saunders College Publishing, Fort Worth, U.S.A.
35) Snustad, D.P. and Simmons, M.J. 2000. Principles of Genetics, John Wileys Sons, Inc, U.S.A.
36) Fakui, K. and Nakayama S. 1996. Plant Chromosomes. Laboratory Methods. CRC Press, Boca Raton, Florida.
37) Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes : Analysis; Manipulation and Engineering. Harwood Academic Publishers, Australia.
38) Bhojwani, S.S. 1990. Plant Tissue Culture : Applications and Limitations, Elsevier Science Publishers, New York. U.S.A.
39) P.K.Gupta Biotechnology.

40) Lea, P.J. and Leegood, R.C. 1999. Plant Biochemistry and Molecular Biology. John Wiley & Sons, Chichester, England.
41) Old, R.W. and Primrose, S.B. 1989 : Principles of GeneManipulation. Blackwell Scientific Publications, Oxford, U.K.
42) Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue culture, Kluwer Academic Publications, the Netherlands.
43) Devi, P. 2000. Principles and Methods of Plant Molecular Biology, Biochemistry and Genetics, Agrobios, Jodhpur, India.
44) Moore, T.C. 1974. Research Experiences in Plant Physiology. A Laboratory Manual. SpringerVerlag, Beerlin.
45) Smith, R.H. 2000. Plant Tissue Culture; Techniques and Experiments. Academic Press, New York.

46) Dr.H.N.Shrivastav - Cell Biology and Genetics - New Millenium Edition - Pradip's.
47) P.S.Gill - Plant Physiology, S.Chand & Co. New Delhi, Edition - Pradip's, Botany Vol. II.

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15. ZOOLOGY
(EFFECTIVE FROM THE SESSION 2005-2006)

The examination shall comprise three theory papers and a practical Each theory paper shall be of 3 hours duration and shall carry 40 marks. The practical shall be of 4 hour's duration and shall carry 30 marks. The syllabus is based on 6 theory periods and 6 practical periods per week. Candidate are required to pass seperately in theory and practical examinations.

(**Note :-** Paper VII and VIII are compulsary paper, while paper IX is optional paper. At least one paper will be opted by the college.)

Paper VII
ADVANCE GENETICS

Max. Marks - 40 Total Period - 60

Unit I : 1.1 Nature and functions of genetic material.Structure of DNA, RNA and Types of RNA.
1.2 Replication of DNA.
1.3 Gene Action :- Cistron, Recon, Muton, Lac operon model.

Unit II 2.1 Chromosomal mutation and gene mutation including structure and numerical alteration in chromosomes with emphasis on polyploidy, Induced mutation and mutagenic agents.
2.2 Molecular basis of mutation.

Unit III 3.1 Human Genetics :- Human pedigree analysis with symbols used. Philadephia, Sickcle cell anaemia, Thalessemia,
3.2 Biochemical Genetics :- Gene enzyme relationship in man with reference to Phenyl ketonuria (PKU) and Alkaptonuria and Albinism.
3.3 Lethal genes :- Lethal genes in man. Dominance and recessive and intermediate genes modification of ratio due to lethal genes.

Unit IV 4.1 Genetic Engineering technique -Technique used in genetic engineering (Shotgun method, southern blotting technique) and application of genetic engineering, transgenic animals, cloning in animals.

Unit V 5.1 Applied Genetics :- Diagnosis of genetic defects Amnocentesis. Sperm and egg banks. Birth control measures, sterilization. Statutory ban on marriages among close relatives spread of genetic Royal diseases (Haemophilia).

Paper VIII
ANIMAL EVOLUTION

Max. marks - 40 Total Periods - 60

Unit I 1.1 Origin of life. (defination of life, special creation theory, Hindu concept of origin of life), Theory of sponteneous generation or Abiogenesis. Theory of eternity of life, Hypothesis of panspermia, Theory of chemical evolution at a molecular level, and experimental support to it, modern self assembly theory.

Unit II 2.1 Concept and evidences of organic evolution (evidences of organic evolution from embryology, palaentology, anatomy, molecular biology.)
2.2 Theories of organic evolution. (Lamarckinism, Darwinism, Neo Darwinism.)

Unit III 3.1 Concept of species (species, Race and Deme), Nature of speciation, potential mode of speciation, Instantaneous speciation, gradual speciation.
3.2 Geological time scale : (a) Archaezoic era, proterozoic era, palaezoic era, mesozoic era, coenozoic era.

Unit IV 4.1 Fossils and evolutionary rate. (Fossils and fossilization), Types of fossils & unulteral, petrifactions, moulds, castes and impressions, condition for fossilizations, dating of fossils (Lead, radio, carbon, pottassium orgen method.)

4.2 Phylogeny of Horse. (Orohippus,Epihippus, Mesohippus, Miohippus, Parahippus, Merychippus, Phiohippus, Eqqus.

Univ V 5.1 Evolution of man.

5.2 a) Neanderthalers, cromagnoo man
b) Javaman, Pecking man, Hieldeberg man.
c) The modern human phase (Homo sapiens)

List of Recommended Books

01. Ecology and environment - P.D. Sharma
02. Fundamentals of ecology (W.B.Sounders) - ODUM.
03. Evolution (WH Freeman - Dobzhansky.
04. Genetics and origin of species (Columbia University press) - Dobzemsky.
05. Population, species & Evolution - Major.
06. Animal cytology and Evolution - White.
07. Verma, P.S. and V.K.Agrawal - Genetics, S.Chand and Co.,
08. Lewis, C.D. and Lewin, R. Biology of Gene. McGraw Hill, Toppan Coll.
09. Gunther S. Stent, Moleclar Genetics, Mcmillan publishing Co.Inc.
10. Goodenough, V. Genetics, New York Holt, Rinchart and Winston.
11. Gardner, Principles of Genetics, wiley Eastern Pvt.Ltd.
12. Stickberger, Genetics, Machmillan publications.
13. Pai. A.C. Foundation of Genetics, McGrow Hill publications.
14. Veerbala Rastogi - A text book of Geneics.
15. K. B. Ahuvalia - Genetics.
16. Winchester - Genetics.
17. R. V. Rathwel - Humangenetics - Publi. prentice Hall, New Delhi.
18. Population species and evolution - major.
19. A Text Book of Evaluation by Dr. D.S.Dabhade, Dr. I.A.Raja, Dr.R.A.Gulhane, Dr.A.P.Charjan, A.K.Patki, Dr.P.S.Patil, Published by Sanket Publication, Washim.

Paper IX
(OPTIONAL)
APPLIED ZOOLOGY
1. AQUACULTURE

Max. Marks - 40 Total Period - 60

Unit I 1.1 Aquaculture - defination, scope, importance and present status in India.

1.2 Planning and consturction of freshwater fish farm, types of fish ponds, site selection, layout, soil and physiochemical characteristics of pond water.

1.3 Management of nursery and rearing ponds, liming fertilization, control of aquatic weeds, predatory fishes and insects.

Unit II 2.1 Management of stocking ponds, fertilization and supplementary feeding.

2.2 Selection of culturable species, stocking density and carrying capacity.

2.3 Riverine collection of fish seed.

2.4 Hatching technique - important hatcheries, Chinese circular hatchery unit, transport of fish seed and brood fish.

Unit III 3.1 Breeding of fish - Artificial breeding by stripping method, Dry and wet bund breeding.

3.2 Role of gonadotrophin in fish breeding.

3.3 Use of new generation drugs; Induced breeding by hypophysation.

Unit IV 4.1 Freshwater system, monoculture, polyculture, cage culture, penculture, sewage fed fish culture.

4.2 Integrated aquaculture, paddy cum fish culture.

4.3 Pearl culture and prawn culture.

4.4 Culture of aquarium fishes, Breeding of Guppy and Molly, care of and feeding of fry and finger lings.

4.5 Fish product and byproduct - fish liver oil, bodyoil, fish meal, fish manure and fish leather.

Unit V 5.1 Importance of microtechnique.

5.2 General fixatives - Alcohol, Acetone, Formaline, Bouin's fluid, Carnoy's fluid, and Formal sublimate.

5.3 Dehydration and significance of use of graded series of alcohol.

5.4 Clearing agents - Xylol, Benzene, Clove oil - merits and demerits.

5.5 Study of Microtome - Rocking and Rotary.

List of Practical

01. Classification, identification and characters of Rohu, mrigal, grass carp, silver carp, common carp, clarius, heteropneustes, ophiocephalus and wallago.
02. Identification and comment on aquatic weeds, acquatic insects and weed fishes.
03. Identification of egg, spawn, fry and fingerlings of Indian major carp.
04. Identification of planktonic organisms (cyclops, diatoms, rotifers etc.)
05. Dissection of fish for alimentary canal and brain.
06. Dissection of Nervous system of prawn.
07. Visit to fish farm to study management practices and breeding techniques and submission of layout of fish farm.

08. Types of microtome - Rocking and Rotary.
09. Preparation of follwoing fixatives. Formalin, alcohol, acetone, Bouin's fluid, carnoy's fluid, formal sublimate.
10. Preparation of alcoholic grades.
11. Preparation of stains - Boraxcarmine, acetocarmin, aceto-orecein, Haema-toxylene and eosin.
12. Fixation of organs.
13. Preparation of Blocks, section cutting, staining and mounting.
14. Use of camera lucida.

BOOKS RECOMMONDED

01. Hand book of breeding major - Indian carp - Jordan.
02. Fish and fisheries of India - V.G. Jhingran.
03. Introduction to fishes - Dr. Rahul Parihar.
04. Wealth of India - Raw material - IVICAR.
05. Life of fishes by - N. B. Marshal.
06. Histology of fish by - N. Norman.
07. Fish Pathology - Roberts.
08. Introduction to fishes - Khanna.
09. Fishery science and Indfian fisheries - Shrivastava.
10. A manual of F.W. Aquaculture - Santhanam.
11. An aid to identification of commercial fishes of India and Pakisthan - Minhra.
12. Tex book of microtechnique and environmental science - Dr. G.N.Vankhade, Dr. Dhande, Dr. S.A. Akarte. - Bajaj publication.
13. Laboratory technique in Modern Biology by swarp H. Pathak, J.C., and S. Arora.
14. Animal tissue technique by G.L. Humason.

Distribution of marks for practical examination.

Time : 4 Hrs.		Marks
01.	Identification, classification and comment on spot. (Fish, aquatic weeds, insects or planktons) 1 to 5	05
02.	Dissection of fish/prawn/insect lofe cycle	04
03.	Microtechnique.	
	a) Secion cutting and spreading of ribbons.	04
	b) Staining of the given slide	03
	c) Camera lucida drawing of the given object.	03
04.	Permanent slides submitted by the examinee (5 Slides)	02
05.	Class record (duly signed by teacher incharge and certified by H.O.D.)	02

06.	Collection of Animals.	02
07.	Viva - voce	02
08.	*Co-curricular Activity Report	03
	Total Marks	**30**

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

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Paper IX
(OPTIONAL)
APPLIED ZOOLOGY
2. ECONOMIC ENTOMOLOGY

Max. Marks - 40 Total Period - 60

Unit I
1.1 General characters and classification of Insects.
1.2 Common Agriculturel pests - Identification, Life-cycle, Damage and control measures of the following pests.
Cotton - spotted bollworm, Pink bollworm, Red cotton bug.
Gram pod borer - (Helicoverpa)
Jowar - Stem borer, Midge fly.
Sugar Cane - Pyrilla.

Unit II
2.1 Identification, life cycle, damages and control measures of pests of domestic animals.
Horse - Horse fly, stable fly.
Cattle - Buffalo - fly,
2.2 Disease transmitting Insects in Human beings, Mosquito, Housefly, Human louse, Human fleas

Unit III Industrial Entomology.
3.1 Sericulture - Life history of silk-moth, rearing, diseases, & economic importance.
3.2 Apiculture - Life cycle of Honey bee. Bee-keeping, uses of honey and Bee-wax
3.3 Lac-culture - Biology of lac-insect, method of lac-culture and uses of lac.

Unit IV Pest Control methods.
4.1 Chemical control - Chemical Insecticides - classification and their application.

4.2 Biological control.
4.3 Legislative control.

Unit V 5.1 Importance of microtechnique.
5.2 Types of fixatives - Alcohol, Acetone, Formaline, Bouin's Fluid, carnoy fluid, and Formal sublimate.
5.3 Dehydration and significance of uses of graded alcohol.
5.4 Clearing agents - Xylol, Benzene, Clove oil, merits and demerits of clearing agents.
5.5 Study of Microtomes - Rocking and Rotary.

Books Recommended

1. Tembhare, D. B. "T.B. of Entomology" Himalaya Publishers, New Delhi.
2. Atwal, A.S., "Agricultural Pests of India and South-East Asia. Kalyani Publishers New Delhi.
3. Richards, O.W. and Davis, R.G. "General Text book of Entomology" 10/ed Chapman & Hall, New York.
4. Metcalf & Flint - Destructive & useful insects.
5. Pruthi, H.S. Text Book of Agricultural Entomology.
6. David, V.B. & Kumarswami "Elements of Economic Entomology"
7. Zoology Applied - A.D. Marathe, V.S. Agancer, Narendra Prakashan Pune- 2
8. Economic Zoology - Skulkla Upadhaya Rastogi publication.
9. T.B. of Microtechnique & Environmental Science Dr. G.N.Wankhade, Dr. R.R.Dhande & Dr. S. A. Akarte. Bajaj Publication.
10. Laborary technique in Modern Biology - by snarup H. Pathak. J.C. & S.Arora.
11. Animal Tissue Technique by G.L. Humason.

List of Practical :

1. Indentification, Classification upto family and characters of following insects. Silkmoth, Honey bee, Red cotton bug, Lemmon butterfly, Grass hopper, Locust, Aphids Jassids and locally available insects.
2. Life Cycle of following Insects. Grasshopper, Cockroach, Silk moth, Honey bee, Drosophila, House fly, Mosquito.
3. Collection of local Insects.
4. Visit to Sericulture, Apiculture, Local crop pest.
5. Preparation of following fixatives - Alcohol, Acetone, Formalin, Bouin's fluid, Cornoy fluid, Formal Sublimate.
6. Preparation of Alcoholic grades.
7. Preparation of stains - Borax caramine Acetocarmin, Aceto-orcein, Haematoxyline, Eosine.

8. Fixation of organs.
9. Types of Microtome - Rocking and Rotary.
10. Preparation of blocks, Section cutting and staining & mounting.
11. Use of camera lucida.

Distribution of Marks for Practical Examination.

Time : 4 Hrs.		Marks
01.	Identification, classification and comment on spot. (fish, aquatics weeds, insects or panktons) 1 to 5	5
02.	Dissection of fish/prawn/insect life cycle.	4
03.	Microtechnique.	
	a) Section cutting and spreading of ribbons.	4
	b) Staining of the given slide	3
	c) Camera lucida drawing of the given object.	3
04.	Permenent slides submitted by the examinee (5 Slides)	2
05.	Class record (duly signed by teacher incharge and certified by head.)	2
06.	Collection of Animals (A visit to fish form)	2
07.	Viva - voce	3
08.	*Co-curricular Activity Report	

Total Marks : 30 Marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

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List of Equipments/Apparatus required for the Zoology practicals for B.Sc.Final.

1.	Haemocytometer	10
2.	Oven	1
3.	Rotary microtome	2
4.	Camera lucida (Prism type)	5
5.	Occulometer	5
6.	Micrometer Scale	5
7.	Photographic Camera	1
8.	Camera Roll	
9.	Photographic Papers	
10.	Printing enlarger	1
11.	Compound mciroscope	10

12.	Refrigerator	1
13.	Microtome blades	
14.	Haemoglobinometer	5
15.	Blood pressure apparatus	1
16.	Wooden slide Cabinet	1
17.	Staining Racks	10
18.	Wax Bath	1
19.	Slide warmer	2
20.	Staining jars with lids	2 dozons
21.	Antiserum A	
22.	Antiserum B	
23.	Antiserum D	
24.	Haemocytmeter	10
25.	Species of Earthworm (Presered)	
26.	Species of Prawn (Presered)	
27.	Species of fishes (Presered)	
28.	Species of Honey bee (Presered)	
29.	Species of Lac Insect (Presered)	

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16. ELECTRONICS (INSTRUMENTATION)
(Effective from the session 2007-08)

The examination in Electronics (Instrumentation) at the end of Final Year shall comprise three theory papers of 40 marks each of 3 hours duration and practical examination of 30 marks.

The distribution of marks is as under :

1.	One Expt.	-	09 Marks
2.	Practical Record	-	03 Marks
3.	Viva on expt.	-	03 Marks
4.	Project (experimental)	-	09 Marks
5.	Project Report	-	03 Marks
6.	*Co-curricular Activity Report	-	03 Marks
		Total :	30 Marks

* A batch of project work shall not be more than four students.

* A study / excursion tour to Electronic Industries, Research and

Education centres is essential.

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

Paper-VII

ADVANED INSTRUMENTATION

Unit-I : **Timer and PLL :**
IC 555 Timer - Block diagram and Functions of each block. Application of 555 timer - As astable & monostable multivibrator. IC565 PLL - Block diagram and Functions of each block. Application of PLL as FM demodulator, AM detector & frequency synthesizer.

Unit-II : **Display and Digital Instruments :**
Segmental Dispaly, 7 - segment of 14 - segment, dot matrix, LCD display, Digital frequency meter, Digital voltmeter (Ramp type), digital capacitance meter (Block diagram and Functions of each block).

Unit-III : **Recorders :**
Necessity of recorders, X-Y recorder, magnetic tape recorder. ECG, EMG, EEG (Block diagram and Explanation block).

Unit-IV : **Medical Instrumentation :**
Instantaneous heart rate meter, systolic & diastolic blood pressure meter, EAR, oximeter, pulse oximeter, range gated pulsed Dopler blood flow Meter, Laser Dopler blood flow Meter.

Unit-V : **Temperature Measurements :**
Resistance Thermometer, thermister, thermocouple & their use in measurement of temperature.
Infrared (IR) Pyrometer and total radiation pyrometer.

PAPER-VIII

ADVANCE MICROPROCESSOR AND MICROCONTROLLER SYSTEM

Unit-I : **8086 Architecture :**
Block diagram of 8086 microprocessor, BIU & EU, operating modes of 8086, Registers of 8086 - general purpose register, pointer and index registers, segment registers, instruction pointer, status flag.

Unit-II : **Instruction and Programming of 8086 :**
Addressing modes of Intel 8086, 8086 instructions, 8086 bus cycle.

Programming : Programming on data transfer, addition, substrction, division, multiplication using various addressing modes.

Unit-III : **Microcontroller :**
Introduction, comparison of microcontroller & microprocessor, block diagram of 8051 & study of internal blocks, reset clocks, registers, flags & internal memory, I/O ports, counter & timers, interrupts.

Unit-IV : 8051 Instruction Set and Bit and Byte Level programming, Instruction set, addressing mode - moving data, arithmatic & logical operation, jump & CALL programming of Bit & Byte, Additions, substraction, multiplication, division, secondary & Bisecondary.

Unit-V : **8051 Interfacing & Application :**
Basics of serial communication interfacing with RS-232C interfacing a DAC, interfacing to the 8255, power down mode.

OR

Paper-VIII

MODELLINGAND SIMULATION : APPLICATIONS IN ELECTROANICS

Unit-I : Concept of modelling and simulation, concept and need of modelling, different types of models - mathematical model, Equivalent circuit model. Empirical model, Block diagram model, modelling methodology, concept and need of simulation, applications of simulations.

Unit-II : **PSPICE :**
Features, circuit simulation unity PSPICE, Modelling of various passive and active electronic components, power devices and sources DC, AC, transient, fourier and noise analysis, simulation of analog and digital circuits.

Unit-III : **Numerical Techniques :**
Need and role of numerical methods in modelling and simulation. Solution of simultaneous equations (Gauss Elimination, pirotal condensation, Gauss-Sedial methods.

Unit-IV : **Fourier Analysis of Signals :**
Fourier series, Evaluation of Fourier coefficients, Fourier transforms, Magnitude and phase spectrum of signals.

Unit-V : **Modelling and Simulation using MATLAB / PSPICE :**
Use of matlab for solving Mathematical and numerical techniques.

Modelling and Simulation of Electronic Devices and Circuits.

Recommended Books :

1) Fundamentals of Modelling and analysing Engineering System - Philip D. Chas, Rosemberg, Clive Dym, Cambridge University Press, (2001)
2) SPICE for circuits & electronics using PSPICE by Mohd H.Rushid, Prentice Hall of India, 2nd Ed. (2000)
3) PSPICE and MATLAB for Electronics, An integrated approach : John Attia, CRC Press (2001).
4) Numerical Analysis : S.S.Sastri, Tata McGraw Hill (2001)
5) Applied Numerical Methods for Engineers : Using MATLAB & C-Robert J.Schilling Sandra L., Harris, Books / Cole Publishing Company (2000).

Practical List :

Every student is expected to perform at least 15 experiments from list of experiments. Project work is compulsory for every student.

List of Experiments

1. Practical based on PSPICE & MATLAB -
   (a) Use of Mathematical functions and 2-D plots.
   (b) Use of 3-D plots.
   (c) Use of MATLAB for mathematical modelling.
   (d) Use of MATLAB for Numerical Techniques.
   (e) Matrix Operations
   (f) Image display and processing
   (g) DC - Analysis - Verification of Network theorems.
   (h) AC - Analysis - Rectifiers, filters, Clipper, Clamper.
   (i) Amplifier Simulation - DC/AC/Transient and Fourier Analysis.
   (j) Digital Circuit Simulation.
2. Programme for addition using 8086 microprocessor.
3. Programme for substraction using 8086 microprocessor.
4. Programme for multiplication using 8086 microprocessor.
5. Programme for division using 8086 microprocessor.
6. Measurement of temperature by thermister.
7. Measurement of temperature by thermocouple.
8. Study of Amplitude modulation.
9. Study of Freqency modulation.
10. Study of optical fiber communication kits.
11. BASIC programming on personal computer.
12. Study of Television kits (B/W and Colour).

13. Study of data aquisation system using computer.
14. Study of ECG recoder.
15. Study of T.V. cammera.
16. Study of Video Cassete Recorder/player (VCP) (Electrical Circuit tracing, measurement of signal at various points)
17. Study of tape recorder/player system/ CD(electrical circuits, measurement of signal at various point, trouble shooting)
18. Study of X-Y/X-T recorder.
19. Study of PC based logic controller card.
20. Study of PC based ADC card.
21 Study of PC based DAC card.
22. Study of PC based temperature controller card.
23. Study of microphone/loud speaker characteristics.
24. Study of RAM and EPROM memory.
25. Study of pulse code modulation system.
26. Five experiments on I.C.555 timer.
27. 5 - Experiments based on Microcontroller (8051)

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PAPER IX
ELECTRONICS COMMUNICATION SYSTEMS

Unit I : **Modulation :**
Need, Types, Theory of AM, power distribution in AM, generation of AM (collector modulator), Theory of FM, frequency spectra, generation of FM, PCM.

Unit II : **Demodulation, Transmitter & Receiver :**
Diode detector, slope detector, Block diagram and working of AM & FM transmitter, TRF receiver, superheterodyne receiver.

Unit III : **Television System :**
TV broadcasting system, TV camera tubes – Image orthicon & Vidicon, Scanning & synchronization, Composite video signal, Block diagram of B/W TV transmitter and receiver. Introduction to color TV – Principles.

Unit IV : **Optical fibre communication system :**
Introduction, Optical sources, photo detectors, Block diagram of optical communication system & function of each block, Advantages and disadvantages.

Unit V : **Digital communication :**

Data transmission – bandwidth, Serial and Parallel Transmission, Direction of data transmission (Simplex, half duplex, full duplex), mode of data transmission (Asynchronous & synchronous), Communication channels : Telephone lines, coaxial cable, Fiberoptic cable, microwave, satellite. Network : Concept of LAN, WAN, MAN, Internet.

Books Recommended :

1. Communication electronics by A.Kumar.
2. Electronic Communication by Roddy & Collean.
3. Telecommunication principle circuits & system S.Rambhadran.
4. Principle of communication system by Taub and Schilling.
5. Basic Electronics B.L.Theraja
6. Optical fibre system and applications Technology & design by Kao.
7. Optical fibre communication by Keiser.
8. Modern Digital and Analog Communication System 3/e by B.P.Lathi.
9. 8051 Microcontroller and embeded system - Mazidi & Mazidi, Prentice Hall (2000)
10. 8051 Microcontroller Architecture, programming & application - Kemeth J. Ayela Thompson Learning (1998)
11. Hand books of Microcontroller - Predko, Tata McGraw Hill 2001.
12. Microprocessor Theory & Application - M.Rafiquzzamon, PHI New Delhi.
13. Handbook of Biomedical Instrumentation, 2nd Ed., R.S.Khandpur, Tata McGraw Hill Ltd. (2003)
14. Biometical Instrumentation - Principles, Measurement and Design, G.Haridasan, Vipul Prakashan Mumbai.
15. Microprocessor and Microcomputer - B.Ram.
16. Electrocal and Electronic Instrumentation - A.K.Sawhney.
17. Electronic Instrumentation - D.Cooper
18. Linear Integrated Circuits - K.R.Butkar.

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List of optimum apparatus required to perform the practical for a batch of 16 students for the subject electronics for B.Sc. -I/II/III.

Sr. No.	Name of Apparatus	Minimum Numbers
1.	VTVM/FET VOM	05
2.	CRO	05
3.	CRO DUAL TRACE	02

4.	Function Generators		10
5.	Frequency Counter		01
6.	RF Generator		01
7.	Digital Multimeter		05
8.	Multimeters		15
9.	AC Millivoltmeter		01
10.	Voltmeters	a) 0 - 1 V	02
		b) 0 - 5 V	06
		c) 0 - 10 V	10
		d) 0 - 15 V	06
		e) 0 - 30 V	02
11.	Ammeters	a) 0 - 100 mA	02
		b) 0 - 250 mA	04
		c) 0 - 500 mA	04
		d) 0 - 1 mA	04
		e) 0 - 5 mA	04
		f) 0 - 10 mA	06
		g) 0 - 20 mA	06
		h) 0 - 50 mA	06
		i) 0 - 100 mA	06
		j) 0 - 250 mA	02
		k) 0 - 500 mA	02
		l) 0 - 1A	02
12.	Stabilised D.C. Power Supply - 1A		
		a) 0 - 9 V	05
		b) 0 - 12 V	10
		c) 0 - 30 V	03
		d) 0 - 5 stabilised for 78xx series.	07
		e) +15 V and -15 V	04
13.	Dimmerstat		02
14.	Table Lamp		02
15.	Resistance Boxes		10

16.	Rheostates	05
17.	Soldering Gun & Desoldering Gun	08
18.	Wire metal and paste	500 gm & 1 pack each.
19.	Stop watch, Continuity Tester	03
20.	Microprocessor kits	10
21.	PC (Pentium-IV with Printer)	02
22.	Microprocessor unit 8086	04
23.	Experimental boards of each expt. as per sullabus	01 each.
24.	All electrical & electronic tools	each 01 of each type.
25.	bread boards	12
26.	Patch chords & sockets	as per req.
27.	Wires, buttons, fuses & other materials	-”-
28.	Linear & digital IC tester boards	each 01

List of Loose Components

Sr.No.	Component		Quantity
1.	Registers - 1W		SD (pieces of each)
2.	Capacitors - 30V		10 (pieces of each)
3.	Inductors		2 (pieces of each)
4.	Transistors		
		a) AC 127/128	
		b) BC 147/148	
		c) SL/HL 100	
		d) BC 107/108	15 pieces of each
		e) others if necessory	
5.	Diodes		15 pieces of each.
6.	UJT/SCR/Diac/Triac		05 pieces of each.
7.	Potentiometers		
		a) 0 - 500	05
		b) 0 - 1K	10
		c) 0 - 2K	10

	d) 0 - 5K	08
	e) 0 - 10K	05
8.	Step down transformers	03 pieces each.
9.	ICs 741/3085/555 /565 723/78XX/79XX 74XX series	each 05
10.	Other Missilaneous components for designing & construction	as per requirements.

17. BIOLOGICAL TECHNIQUES & SPECIMEN PREPARATION (Vocational)

The examination in " Biological Techniques and Specimen Preparation", will comprise of two theory papers and a practical examination. Each paper will be of three hours duration and carry 60 marks.

The practical examination will be of 6 (six) hours duration and carry 30 marks.

Each Unit of theory paper will carry two questions with Internal Options to solve any one question. Candidates are required to pass separately in theory and practical.

Project work at the end of year will carry 10 marks. The students have to submit a project at the end of the year and it will be evaluated by the examiners appointed for the annual practical examination.

Study tour will be compulsory for collection of Animal/Plant specimen during first year which will be treated as a part of "on the job training."

The following syllabus is based on 6(six) theory papers and 6(six) practical periods (of two terms of 3 periods each) per week.

PAPER-V
BIOCHEMICAL, RADIOLOGICAL TECHNIQUES AND ADVANCED INSTRUMENTATION

UNIT I : Restriction enzymes & their uses. Southern, Northern & Western blotting techniques, DNA seuencing, SDS-Polyacrylamide gel electrophoresis.

UNIT II : Antibiotics & Screening for sensitivity, Immobilized enzymes, Antibody production, ELISA test.

UNIT III : Molecular hybridization. Routine clinical tests eg. coenzymes, thryroxine, cholesterol. Embryo culture-plants and animals.

UNIT IV : Molecules of the cell - structure and function- sugars, aminoacids, fatty acids, nucleotides, polysaccharides, peptides and proteins, DNA, RNA triglycerides, steroids, vitamins,pigments, Specimen preparation and data analysis using Electron microscope, spectrophotometer, NMR, ESR, Ultracentrifuge, computerised image production, HPLC, GLC, Electro-porators (on availability)

UNIT V: Types and sources of radiations, effect of various types of radiations on biological system. Isotopes-definition, Isotopes of common biological use, techniques for detection of isotopes e.g.autoradiography, Geiger counting technique, liquid, scintillation, gamma counter, isotopes dilution technique ; waste disposal and cleaning of contaminated glassware. Safety in use of radiation sources and radioisotopes.

PAPER-VI
PRODUCTION AND MARKETING OF BIOLOGICAL SPECIMENS

UNIT I : Market survey techniques, Organisation of production centre-minimal requirements; stagewise expansion.

UNIT II : Purchase, collection and storage of raw materials. Costing of biological specimens, sales tax, packaging, forwarding, exemption for educational institutions. Accounts, book-keeping, quotations.

UNIT III : Quality control, Storage and packing of finished products. Recovery of waste materials.

UNIT IV : Enterpreunership, development and marketing, Endangered plant and animal species and their preservation.

UNIT V : Computer : Hardware, software and applications of computers in Biotechnology and Biological specimen preparation.

PRACTICAL COURSE

1. Southern, Northern and Western blotting techniques.
2. PAGE (Poly Acrylamide Gel Electrophoresis)
3. Radiation sources and their working
4. Effect of gamma radiation on germination of seeds and determination

of lethal dose.

5. Handling and dilution of radio active isotopes.
6. Use and maintenance of Geiger counter.
7. Biochemical techniques -Identification of sugars, amino acids, fatty acids, poly saccharides, proteins, DNA, RNA.
8. Market survey techniques.
9. Costing of Biological specimens, quotations.
10. Storage and packing of finished goods.
11. Recovery of waste materials.
12. Use of computer in the maintenance of stock, quotations etc.
13. Project work.

PRACTICAL EXAMINATION

(30 Marks)

Q.1	Polyacrylamide gel electrophoresis or Southern blotting techniques or Biochemical techniques as per theory	5 Marks
Q.2	Processing of assorted data by using computer or Preparation of order/bill as per quotation	5 marks.
Q.3	Identification of endangered plants and animal species (5 spots)	5 marks.
Q.4	Project	10 Marks.
Q.5	Practical record & Viva voce	5 marks
	Total :	30 marks

BOOKS RECOMMENDED FOR PAPER V AND PAPER VI

1. Fundamentals of Biotechnology : Prave, P.Fanst, U.Sitting, W and Subatsen, D.A. (Gds.) VCH Publishers Germany.
2. Introduction to Biotechnology : Brown, C.H. Campbell, I. and Priest, F.G. Blackwell scientific Publications, Oxford.
3. Cell and tissue culture : Pant J.,E.and S Livingstone Ltd. London.
4. Hand book of Immunology : D.M.Weir, Blackwell scientific Publications, London.
5. Basic and clinical Immunology : D.P.Stites, J.D. Stobo, H.H.Fundenberg, J.V.Wells, Lange Medical Publications Maruzen Asia (Pvt.) Let Singapore.
6. Threatened animals of India : B.K.Tikade, Pub.Zoological survey of India.
7. Genetic Engineering : S.Mitra, McMillan India Ltd. New Delhi.
8. Chromatography : Ladener, E.& M.Ledever Elsevier Publishing Co. London.
9. Hawk's Physiological Chemistry Oser, B.L.Tata McGraw Hill Publishing Co. Ltd. New Delhi.
10. Spectroscopy : Browing , D.R.McGraw Hill, London.
11. pH values and their determination : BDH Laboratory chemicals division.
12. Essentials of Animal Physiology : Rastogi S.C., Wiley Eastern Ltd., New Delhi
13. An introducation to Electronics for Physiological workers : Whitfield I.C.Mcmillan Co. London.
14. Electronic apparatus for Biological Research : Donaldson P.E.K.Pub. Butterworth, London.
15. Experiments in Microbiology Plant Pathology and tissue culture : Aneja K.R., Willey Eastern Ltd. New Delhi.
16. Marketing management : Sherlekar S.A., Himalaya Publishing House, New Delhi.
17. Low cost chemical instrumentation : Sane K.V., University of Delhi,
18. Instrumental methods of Chemical Analysis : Chatwal, Himalaya Pub. House.
19. A course in electrical and electronic measurments and instrumentation : Sawhney A.K., Dhanapat Ray & sons, New Delhi.
20. Instrumental methods of analysis : Willarad & Dean, East West Press, Delhi.

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18.INSTRUMENTATION
(Vocational)

The examination in instrumentation will comprise of THREE papers and a practical examination. Each theory paper will be of three hours duration and carry 40 marks.The practical examination will be of six hours duration and carry 30 marks.

The distribution of marks is as follows :

University practical examination (Two experiments)	18 marks
Sessional work	6 marks
Viva-voce(Three for each expt)	06 marks
Total :	30 Marks

Paper-VII

Signal generation and conditioning

Unit I : Instrumentation Amplifiers : DC Amplifiers, Operational Amplifier, Characteristics Inverting and Non-inverting amplifier, Differentiator and Integrator.

Basic Instrumentation Amplifier : Characteristics, Isolation Amplifiers, Signal conditioning.

Scope : Instrumentation Devices and Systems : Rangan, Sharma & Mani : 2nd Ed., Tata McGraw-Hill

Chapter-11

Unit II : Signal generation and processing : Sine wave generation, Triangle and suare wave generator, Saw-tooth generator, Staircase generator, Modulation, pulse-width modulation, phase detectors, Peak detectors, Signal processing circuits.

Scope : Instrumentation Devices and Systems : Rangan Sharma & Mani : 2nd Ed. Tata McGraw-Hill

Chapter-12

Unit III : Filters : Passive and active filters, first and second order, Types of filters, low pass high pass band pass, band reject Frequency Transformation, Practical filters, Signal analyzers, Methods and applications. (Only qualitative explanation and not mathematical)

Scope : Instrumentation Devices and Systems : Rangan, Sharma & Mani : 2nd Ed. Tata McGraw-Hill

Chapter - 13

Unit IV : Data Acquisition and conversion : Signal conditioning of inputs, Single and Multi-channel data acquisition, Data conversion, D/A and A/D converters, Multiplexers, Sample and Hold circuits.

Scope : Instrumentation Devices and Systems : Rangan, Sharma & Mani : 2nd Ed. Tata McGraw-Hill

Chapter-14

Unit V : Digital signal transmission : Data transmission systems, pulse code formats, Modulation techniques, amplitude, frequency and phase modulation. Serial data communication, Telemetry systems, Frequency division multiplexing, time division multiplexing.

Scope : Instrumentation Devices and Systems : Rangan, Sharma & Mani : 2nd Ed. Tata McGraw-Hill Chapter-15

Reference Books :

1. Instrumentation Devices & Systems - Rangan Sharma
2. Electrical & Electronics Instrumentation - A.K.Sawhney
3. Electronic Instrumentation - D.Cooper
4. Electronic Instrumentation & Measurement - Oliver & Cage.

Paper-VIII

Digital Design

Unit I : Binary systems : Digital computers and digital systems. Binary numbers, Number based conversions, Octal and hexadecimal numbers, compliments, signed binary numbers, Binary codes, Binary storage and registers, Binary logic, Boolean algebra and losgic gates : Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and standard forms, Other logic operations, Digital logic gates, integrated circuits.

Scope : Digital Designs, Morris Mano, Prentice-Hall of India, 2nd ED.

Chapters : 1,2.

Unit II : Simplification of Boolean functions : The map method, 2 & 3 variable maps 4 - variable map, 5-variable map, product of sum simplification, NNAND and NOR implementation, other two level implementations, Don't care conditions, The tabulation method, Termination of prime implicants, selection of prime implicants.

Combinational logic : Introduction, Design procedure, Address, Sub-tractors, Code conversion, Analysis procedure, Multi level NAND circuits, Multi-level NOR circuits, Exclusive OR functions.

Scope : Digital Designs, Morris Mano, Prentice-Hall of India, 2nd ED.

Chapters : 3,4.

Unit III : Synchronous sequential Logic : Introduction, Flip-Flops, Triggering of flip-flops, analysis of clocked sequential circuits, state reduction and assignment, flip-flop excitation table, design procedure, Design of coutners. Registers counters and the memory units : Introduction, Registers, Shift registers, Ripple counters, Synchronous counters, Timing sequences, Random Access memory (RAM), Memory decoding, Error correcting codes.

Scope : Digital Designs, Morris Mano, Prentice-Hall of India,

2nd ED.

Chapters : 6,7.

Unit IV : MSI and PLD components : Introduction, Binary adders and sub-tractors, Decimal adders, Magnitude comparator, Decoders and Encloders, Multiplexers, Read only Memory (ROM), Programmable logic array (PLA) Programmable Array Logic (PAL).

Scope : Digital Designs, Morris Mano, Prentice-Hall of India, 2nd ED.

Chapters : 5.

Unit V : Digital Integrated Circuits : Introduction, Special characteristics, Bi-polar transistor characteristics, RTL and DTL circuits, TTL, Emitter-coupled logic, MOS and C-MOS, C-MOS transmission gate circuits.

Scope : Digital Designs, Morris Mano, Prentice-Hall of India, 2nd ED.

Chapters : 10.

Reference Books :

1. Digital Electronics by V.K.Jain
2. Digital Principle and application by Malvino & leach.
3. Digital Electronics & Its application by R.P.Jain
4. Digital Electronics by Malvino & Leach.

Paper - IX

Microprocessors and Instrumentation Systems

Unit I : Introduction to Data processor and Processor System. Microprocessor Architecture and its operation, Memory, Input Output (I/O) Devices Review of Logic devices for Interfacing. The 8085 MPU, its architecture, Example of 8085 - Based Microprocessor System, Memory Interfacing, 8085 Memory Systems.

Scope : Microprocessor Architecture, Programming and Applications with 8085, 3rd Edition, Ramesh S.Goankar Penram International Publication 1996, Chapter : 1,2,3.

Unit II : The 8085 programming model, Instruction format, Instruction classification, Data Transfer (Copy) operation, Arithmatic Operation, Logic Operation, Branch Control Operation, Rotate & Special Operations, Machine Control Operation.

Scope : Microprocessor Architecture, Programming and Applications with 8085, 3rd Edition, Ramesh S.Goankar Penram International Publication 1996, Chapter : 5,6.

Unit III : Writting Assembly Language Programmes (ALP) Some puzzeling questions Programming Techniques Looping Counting, and Indexing. Stack and its operations, Subroutines, Nesting of Subroutines, Delays, Display programmes. Microprocessor based soft were development System Operating Systems, Assemblers and Cross Assemblers Writting programms using a Cross Assembler.

Scope : Microprocessor Architecture, Programming and Applications with 8085, 3rd Edition, Ramesh S.Goankar Penram International Publication 1996, Chapter : 7.8,9,11.

Unit IV : Interfacing I/O Devices, Basic Interfacing Concept, Interfacing output Displays, Input KBD Devices, Memory mappeed I/O, Interrupts, 8085 Interrupt, Vectored Interrupt.

Scope : Microprocessor Architecture, Programming and Applications with 8085, 3rd Edition, Ramesh S.Goankar Penram International Publication 1996, Chapter : 4,12.

Unit V : The 8255 A PPI, Illustration : Interfacing Keyboard and Seven Segment Display Illustration : Bidirectional Data Transfer between two Microcomputers. Illustration : Interfacing DAC's and ADC. Generation of square, Triangular, Saw-Tooth Waveforms. Data aquisition : Diode Characteristics.

Scope : Microprocessor Architecture, Programming and Applications with 8085, 3rd Edition, Ramesh S.Goankar Penram International Publication 1996, Chapter : 13.

1) Practicals : 15 practicals based on three theory papers.

2) Enterpreneurship - 3.

Reference Book :

1) Microprocessor & applications, by Mathur
2) Microprocessor & Microcomputer by B.Ram.
3) Microprocessor & Application by D. Hall.
4) Microprocessor & programming by Rao.

Entrepreneurship -III

1. Subject overview : Importance of the inputs, review of the preparations completed during last year.

2. Business plan : importance of business plan, content of business plan, how to prepare business plan.
3. Financial Management : Importance of financial management, techniques of managing finance.
4. Management of working capital : Reinforcement of the concept of working capital, factors to be controlled in managing working capital, tools and techniques.
5. Books of account : Importance of accounting assessment, different books and its relevance, support stationary and its use, operating mechanism.
6. Financial statements : importance and interpretation, profit and loss account, balance sheet, chart flow/funds flow.
7. Marketing management : Marketing for small business, strategies for sales promotion.
8. Export marketing : understanding international business environment, Procedures and formalities, Do's and don'ts for exports.
9. Sales Promotion and Pricing : Sales promotion, tools and techniques for sales promotion, pricing policy and its implication on sales.
10. Material management : Concept of inventory control and importance, tools and techniques for managing the materials.
11. Inventory control and quality management : Defining quality and its concept, aspects of quality management, ISO 9000 certification, total quality management (TQM).
12. Enterprise establishment & credit disbursement facilities : Finaicial support from financial institutions, procedures for applications, disbursement procedure, do's and don'ts.
13. Legal implications : Income tax, sales tax excise, labour laws, factory act, pollution control act, etc.
14. Visit to small-scale industries : To understanding problems and issues involved in launching and managing an enterprise.
15. Interaction with entrepreneurs,
16. Inter personal relationship : The concept and importance, development
17. Reinforcing entrepreneurial motivation & competencies.
18. Proejct report preparation - assignment : A detailed project report will be given to the students. They will prepare their own project report under guidance of faculty.

List of Equipments components for B.Sc. I,II,III

Instrumentation (Vocational)

		Quantity
1.	Vernier Instruments	01
	a) Vernier Calliper	01
	b) Height guage	01
	c) Depth gauge	01
	d) Dial indicator	01
2.	Comparator	01
3.	Interferometer	
	a) Optical interferometer	01
	b) Laser interferometer	01
4.	Lathe Machine	01
5.	Piller type drilling machine	01
6.	Basic optical devices	01
	a) Telescope	
	b) Simple Compound Microscope	02
7.	Different types of prism	each 1
8.	Opthalmic lenses	each 1
9.	Special glasses	each 1
10.	Vaccum pumps	1
11.	Electronic Components (Caoacutir, Resistor) standard values Inductor, Iransformer)	each 6
12.	Voltmeter of standard range	each 10
13.	Ammeter of standard range	each 10
14.	Multimeter	05
15.	Semiconductor diode, Zener, Thermistor, Tunnel	1 dozen
16.	D.C.Power supply	05
17.	Transistors	1 dozen
18.	Audio Oscillator	04
19.	FET	04
20.	Mosfet	04
21.	UJT	02

22.	Thyristor	02
23.	Optoelectronic Devices	1 dozen
24.	A C ammeter, Voltmeter walthourmeter & powerfactormeter	each 2
25.	Digital multimeter	06
26.	RF Voltage & power m eter, Q meter	01
27.	CRO	03
28.	LVDT	01
29.	Tachometer	01
30.	Thermocouple	01
31.	OP Amp IC (741)	06
32.	Signal generator (AF & RF)	03
33.	A/D converter	01
34.	D/A converter	01
35.	Logic trainer kit	04
36.	ICS,7400,7402,7404,7408,7432,7494,7483, each 7490,7476,7495	05
37.	Flip flops, unit	01
38.	Counters unit	01
39.	Shift register unit	01
40.	Microprocessor Trainer Kit 8085	05
41.	S.M.P.S.	03
42.	ADV & DAC interfacing unit	each 1
43.	Seven Segment display	01

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19. SEED TECHNOLOGY
(Vocational)

There shall be three theory papers of 40 marks each. Duration of each paper shall be 3 hours. Practical examination shall be of 4 hours duration and of 30 marks.

The syllabus is based on 6 lectures and 6 practical periods per week

"Two on job training" on one month duration shall be compulsory during three years degree course.

PAPER-VII
SEED PATHOLOGY AND SEED ENTOMOLOGY

Unit-I : History of seed pathology
Economic significance of seed borne diseases.
Seed-borne fungi,bacteria,viruses and nematodes
Storage fungi and its impact on animal and human health
Mechanisms of seed transmission
Entry point of seed infection

Unit-II : Influence of environmental factors seed borne diseases
Seed crop management
Management of seed storage
Seed treatment, procedures and equipment
Quarantives of seed health testings
Procedures of sampling for seed health testing

Unit-III : Methods of seed heatlh testing
Inspection of plants beyond the seedling stage
Inoculum density of seed-borne pathogens and its relationship with disease security yield losses
Seed certification and tolerance limits of seed borne pathogens
Seed act in relation to Seed borne diseases
Ecological relationship of seed-borne micro-organisms
National and international cooperation in seed pathology

Unit-IV : Introduction
Role of insects in seed production
General organization of insect Classification
Method of insect classification
Orders of insects of economic importance
Insect body & appendages
External morphology
Type of appendages
Life-cycle of insect
Stages of insect development
Complete and incomplete metamorphosis
Insect-ecology
Definition and its importance

Ecological factors governing

Insect development and population build up.

Economic entomology

Important insect-pests of seed crops, their nature of damage and management

1. Cereal-paddy,maize and sorghum
2. Pulses-Kharif pulses-pigeonpes, mung, cowpeaurd, Rabbi-pulses-chickpea,fieldpea linseed
3. Oil seeds-mustard,castor,linseed groundnut seasnie
4. Vegetables and dry fruits

Unit-V : Beneficial Insects

Type of beneficial insects and their role in seed production

Type of insect pollinators, their usage in crop polination

Honey bees, their social structure and management (bee Keeping)

Insect control

Definition and methods of insect controlvia.

Monitoring usect infestation by different trops

Cultural, mechanical,physucal, quarantine

Chemisal control/pre harvest saniliation spray

Use of plant products invert Waterick

Insecticide formulation and preparation of Spray solution.

Safe application of pesticide

Storage Entomology

Types of insect pests and mites in storage-Nature of damage and losses caused and factors influencing them Sources and development of infestation Detection of infestation Fumigants and methods of fumigation

Seed protectants and their impact on seed viability etc.

IPM strategies for important pests

Plant Protection Equipments

Type of equipments & their principles Safe handing, maintenance and use of machines Rodents and their control in field and seed godowns

PAPER VIII
SEED PROCESSING AND STORAGE

Unit-I : Place and importance of seed processing in the path way of seed improvement. Concept and objectives of seed processong,physical characteristics used to separate seeds, basic flow pattern in seed processing.

Preparing seed for processing the scalper, the debear, the scarifier maize, sheller- licensing of machines.

Seed drying : Importance and advantage of seed drainage, mpisture content recalcitromit/orthodox-and methods of seed moisture measurement, theory of seed moisture measurement, theory of seed drying, moisture measurement,theory of seed drying, methods of seed drying (wet-dry seeds), advantage of mechanical drying over sun drying equipment, dehumidification and drying of heat sensitive seeds. Relative humidity and equillibrium moisture content of seeds.

The air screen cleaner cum grader, vibarating action on a seed separating screen, penetration and retention of seed on a seed screen, selection of screen for seed separation, adjustment of air screen cleaners for improved effciency, cleaning of air seed cleaning machines.

Unit-II : Indented disc and indented cylinder separators construction and operation of indented disc separator construction and operation of indented cylinder separators, adjustments of indented disc and indented cylinder separators.

Specific gravity separation : Parts of the machine, stratification and separation of seeds on the separating deck, adjuctments of a specific gravity separators, starting and operating sequences, separation problems, and their rectification, recleaning the midding product, The stoner, aspirators and pneumatic separators.

Unit-III : Surface texture separation: The roll mill, parts of the machine, separating action and the adjustments, cleaning roll mills.

Affinity for liquid separation , the magnetic separators, the separating action.

Shape or roundness separations, the spiral separator separating

action and operation of spiral seperator, the draper best separator, electrostatic sepeartors, cleaning the spiral separators.

Electronic cocowi sortex-working principle

Quality and measurement of machine performance in essd processing plants indices of machine performance, sampling of product and reject form seed handling machines, seed blending.

Unit-IV : Seed treatment: Seed treatment equipment, slurry treater, mist-o-matic seed treater, parts of the machine, construction and operation, Labelling of treated seeds and related precautions, storage of treated seeds, machine operators and seed users safety.

Site selection for seed processing plant on a seed production farm, Layout of machines in a seed processing plant for efficient product and men movement, mechanical inqury to seeds in post harvest phase, conservation of energy and production in seed processing, maintenance and repair of seed processing equipment.

Seed conveyors and elevators, bucket elevators, belt converors, screen conveyors. oscillation conveyors, pneumatic conveyors, difference between a specific gravity separators and oscillating conveyors installation of bucket elevator, computing the required height of bucket elevators capacity determination of bucket elevators.

Unit-V : Packaging and marketing seeds. begger weigher, bag closing, portable and conveyor type bag closers, lebelling and maintaining lot identity, lot numbers, seed pellets, handling and stacking, maintenance of seed processing records. Seed storage structures : construction, operation and maintence, insulation storage-aeration, air conditioning,dehumidification and stacking, moisture and heat proofing of seed storage structures, seed storage managment.

PAPER IX
SEED FARM MANAGEMENT AND MARKETING

Unit-I : INTRODUCTION : Field of farm management , scope basic principles in farm management, decision making operation and control

DECISION MAKING

APPROACHES : Decision making based on production, cost and capital investment, cost analysis law of diminshing return, opportunity cost, most profitable combination of inputs and output.

Unit-II : PLANNING AND MANAGEMENT OF CROPS,BUILDING AND MACHINERY

Important crops of India,concepts pertaining to various crop production operations viz tillage, irrigation,sowing plant protection, harvesting and threshing maintenance of soif fertility, weeds and their control,mixed cropping mulitiple cropping and dry land farming

Unit-III : Machinery selection and their management determination of field capacity and field efficiency,machinery adjustments.

Consideration in farm buildings implement shed, storage structures.

Unit-IV : FARM BUSINESS : Farm business analysis Farm size, factors affecting profit and economic size of farm.

BUDGET AND RECORD KEEPING :

Farm budgeting,procedure and uses, Farm efficiency measures, farm records and their use.

Unit-V : ACQUISITION AND MANANGEMENT OF LAND LABOUR AND CAPITAL

FARM SURVEYS-Data Collection analysis MARKETING Basic concepts, supply and demand price equilibrium, Seed transportation and storage-cost and returns, cost of processing and packaging, marketing organization for seed marketing, seed markets in India, Structure and working.

Seed market surveys, Projections of supply and demand for different kinds of seed in India-Seed pricing Breeder/Foundation/ Certified Seeds.

PRACTICALS.

SEED PATHOLOGY

1. Demonstration and handling of stereobincular microscope
2. Symptons of important seed borns pathogens
3. Visual examination of dry seeds for disease symptoms

4. Examination of suspensions obtained form washings of seed
5. Viability test-space germination test and tetrazolium test.
6. Infection sites studied by planting seed components.
7. Detection of important seed form fungi-various detection methods
8. Detection of important seed-borne bacteria-various methods.
9. Detection of important seed borne viruses various methods.

SEED ENTOMOLOGY

1. External morphology of insect,type of mouth parts,antenna and legs.
2. Identification of important storage pests, stages of insects.
3. Detection of seed borns insects and estimation of infestation
4. Fumigation- principles and practical application
5. Type of insecticide formulations and their safe use.
6. Plant protection equipments their safe handling and use.
7. Handling of bees for pollination.
8. Collection and submission of stored product pests visit to warehouses and godowns.

SEED PROCESSING AND STORAGE

1. Visit to a seed processing and storage complex and famillarization with different machines.
2. Study of physical characteristics of different crop seeds and their shapes.
3. Determination of physical properties of seeds of different crops
4. Measurement of seed moisture content by direct and indirect methods-Dying methods.
5. Study of a seed pre cleaner,maize sheller and dehusker
6. study of air screen cleaner cum grader
7. Study of indented cylinder and disc seperator.
8. Study of specific gravity separator
9. Study of seed treatment machines
10. Study of seed packaging equipment.
11. Study of bucket elevator, screw conveyors and pneumatic elevators.
12. Measuring peroformance of seed processing machines.

SEED FARM MANAGEMENT AND MARKETING

1. Identification of farm machines and their use
2. Determination of field capacity and field efficiency
3. Soil sampling fertility and moisture content
4. Calibration and abjustment of various farm machines
5. Cost analysis.
6. Farm Planning and Budgeting
7. Record Keeping

Warren L McCabe, Julien C Smith and Peter Harviot. Unit Operation in chemical engineering, Mcgraw Hill International Edition.

PRACTICAL EXAMINATION
DISTRIBUTION OF MARKS

(Note : Draw neat and well labelled labelled diagrams wherever necessary)

		Marks
1.	To calculate the viability of seed by tetrazolium test.	4
2.	Diagnosis of symptoms of seed borne pathogens.	4
3.	Study of the mouth parts, antenna and legs of given insects.	4
4.	Identify and describe the seed specimens and equipments (M),(N),(O),(P)	4
5.	Determination of seed moisture content by	4
6.	Class Record + Viva-Voce	7
7.	*Co-curricular Activity Report	3
	Total marks :	30

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

REFERENCE BOOKS

1. Seed Pathology Vol-I & II P. Naeergaard
2. Principals of seed Pathology Vol-I & II V.K. Agarwal & J.B.Sinclair
3. Seed Treatment K.L.Jeffs.

4. Introductory Mycology C.J.Alexopoulos
5. An introduction to fungi J.P.Srivastava
6. Systemic fungicides R.W. Marsh
7. Fingicides in plant diseases control Y.L.Nene and P.N. Thapliyal
8. An annotated list of seed borne disease Mary Noble and M.J.Richardson
9. Systemic fungicides S.C.Vyas
10. Destructive and useful insects by Metcalf and Flint
11. Insect pollination of field crops by J.B.Free
12. Agricultural Entomology by A.S.Atwal
13. Plant Protection Equipments by O.S. Bindra
14. Billy R.Gregg.Alvin G.Law.S.S. Virde and J.S. Balis, Seed Processing Cooperatively published by National Seeds Corporation, New Delhi, and Mississipi State University and USAID.
15. S.M.Handerson, and R.L.Perry,Agricultural Process Engineering, john Wiley & Sons.
16. Carl W.Hall, Drying Farm Crops
17. A Chakravarty. Post Harvest Technology of Cereals, Pulses and Oil Seeds.
19. Hand book of a agriclture, Indian Council of Agricultural Research, Krishi Bhavan, New Delhi
20. Hunt, D,1968,Farm Power and Machinery Management,Vth edition, 10WA State,U.S.A.
21. John E Kadlec,Farm management Decision, Operation control. Prentice Hall,Inc Englwood,Chiffs, New jersey,U.S.A.
22. Micheal D Boehlje and Verman R.Eidman,Farm Management john Wiley and sons, New York.
23. S.S.Johi and T.R.Kapur,Fundamentals of farm management Kalyani Publishers, India,Ludhiana.
24. A.S.Kahlon and Karam Singh, Economics of farm management in India, Awed Publishers PVT.Ltd.13/14 Asaf Ali Road New delhi/Madras/ Bombay/Calcutta/Bangalore.
25. V.T.Raju and DVS Rao,Economics of farm Production and management,IBH Publishing Co Pvt.Ltd., New delhi.
26. S.S.Acharya,Agricural marketing in India, Oxford and I.B.H.,New Delhi.

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20. COMPUTER APPLICATION
(Vocational)
(Implemented from the session 2008-2009)

The examinations in vocational Computer Application will comprise of two theory papers and practical examination. Each theory paper will be of 3 hours duration and carry 50 marks.

The practical examination will be of 6 hours duration and carry 50 marks.

The distribution of marks in the practical will be as follows

I) Practical :

1)	Practicals based on computer lab V	15 Marks
2)	Viva Voce (based on lab V)	15 Marks
3)	Record/Practical Journal	05 Marks

II. Project :

i)	Project Demonstration	10 Marks
ii)	Viva Voce	05 Marks
iii)	Project Report	05 Marks

Each unit of theory paper will carry two questions with internal options to solve any one questions.

Candidates are required to pass separately in theory and practical.

The following syllabus is based in 8 theory periods and 4 practical periods (of 2 terms of 2 periods) per week.

Paper –V
Java Programming

Unit I: Object Oriented Programming Paradigm, Basic Concepts of OOPs, Benefits and applications of OOPs.

Introduction to Java : History, Benefits and applications, features, Java environment, Java Byte codes, Java virtual Mchine, Security, Platform independence and portability, Java Support System.

Unit II: Java character set, keywords, Identifies, constants, variables, operators and expressions, separators, Data types, Type conversion and casting.

Java Statements : Assignment statement, control statements, structure of Java program.

Methods of Java programming : Application (main) and applet methods, simple Java Programs.

Unit III: Classes, Defining a class, adding variables and methods, creating objects, accessing class members, contructors, the 'this' keyword, Garbage collection, The finalize () method, method overloading, static members, inheritance, method overriding, abstract methods and classes.

Unit IV: **Arrays :** Declaration and initialization of one-dimensional and multidimensional arrays, strings, different operations on arrays.

Packages : Introduction, Java API packages, creating, accessing & using a package, adding a class to a package.

Multithreading : Introduction, creating threads & multiple threads.

Unit V: Error and Exception Handling : Introduction, Fundamental of exception handling, types of errors, types of exceptions, uncaught exception, using try and catch, multiple catch clauses, nested try statement, built-in exceptions, creating your own exception.

Applet Programming : Applet basics, difference between applets and applications, writing applets, applet code, applet life cycle, creating an executable applets and applet tag, running the applets.

Books recommended:

1) The Complete Reference JAVA2 : By Herbert Schildt (Tata & McGraw)
2) The Complete Reference JAVA : By Patrick Naughton
3) Programming with JAVA ... a Primer : By E.Balguruswamy (Tata & McGraw)
4) Programming in JAVA : By S.S.Khandare (S.Chand)
5) Teach Yourself 'Java' in 2 Hrs : By Sams
6) Java for you : By P.Koparkar
7) OOP with C++ : By E. Balguruswamy

Paper VI

ASP Programming

Unit I: **HTML :** Introduction, Components, editor, entering Tags & Attributes, Document structure tags : HTML, HEAD, TITLE,

BODY tags; Text Formatting : Headings, BLOCKQUOTE, PRE, CODE, FONT tags, LIST tags : Unordered & ordered List, Table formatting tags; TABLE, TR, TH, TD tags; Anchor tags, Image tag,

Unit II: **ASP :** Introduction, Dynamic web pages, necessity, scripting languages : server-side and clien-side scripting, Datatypes, variables, constants, operators, Decision making and looping structure, Functions, GET, POST.

Unit III: **Object :** Introduction; object terms : Instances & classes, properties, methods, events, encapsulation; Request object, request object collections : Form, Query string, Server variables collection; properties and methods; Response Object : Introduction, Creating and managing output/ information, content expiration and caching, redirection.

Unit IV: **Cookies :** Introduction, creating, modifying and deleting, Applications objects : Object collection, object methods.

Session Object : Collection, properties & methods. Global.asa file : creating application event code & session event code, declaring objects.

Unit V: **Error Handling :** Types of error - Syntax error, logical error, ASP error, Debugging ASP scripts using response write and conditional tracing.

ASP Components : Server object, AD Rotator component, content Linking component.

Books recommended:

1) Beginning ASP 3.0 : Chris Ullman, David Buser, Jon Durkelt - shroff Publishers & Distributors P.L.
2) ASP3 Programming : Eric A. smith - Wiley Publication.
3) Mastering HTML 4.0 - D.S.Ray, E.J.Ray - BPB
4) Active Servex Pages 3.0 - N. Chare (Que)

Practicals

COMPUTER LAB V : Minimum 16 practicals based on Syllabus of Paper-V & VI.

Project

Project work:

The students have to carryout a mini project work, with group of maximum 03 students, at department/ on the job training center.

Entrepreneurship development (EDP):

In order to create awareness about EDP, to the students of vocational stream, Minimum 10-15 lectures be arranged on this subject with practical case studies.

On the job Training: On the job training be arranged for students.

Study tour: Study tour may be arranged to computer industry / Software development organisation / Institute / Software technology Park / IT Park.

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List of equipments- (Minimum requirement) For Computer-Sc/Vocational Computer Application for B.Sc. part I, II, III

I. Hardware

a) Computer terminals-10 Nos.
Desirable configurations: Pentium-III/IV 64MB RAM, 20/40GB HDD, 1.2MB & 1.44MB FDD, 14"color monitor, 101KBD with modem, LAN card.

b) Printer (DMP)-2nos.
Desirable configuration: 132/80 col with 240cps

c) Inkjet Printer-1no.

d) Multimedia kit-1no.

II. Accessories:-

1) Floppy boxes, 1.44 MB or 1.2MB-2Boxes
2) Printer ribbon(Cartridge)
3) Printer stationary-5000sheet
4) Stabilizer/UPS
5) Internet facility

III. Softwares legal versions based on syllabus.

IV. Other accessories be available based on syllabus.

21. INDUSTRIAL FISH AND FISHERIES (Vocational)

The examination in Industrial Fish and Fisheries will comprise of two theory papers and a practical examination. Each theory paper will be of three hours duration and carry 60 marks.

The practical examination will be of six hours duration and carry 30 marks.

Each unit of theory paper will carry two questions with internal option to solve any one question. Candidates are required to pass separately in theory and practical.

Project work at the end of IIIrd year will carry 10 marks.

Study tour will be compulsory for observation and collection of fishes, prawns, crabs, molluses during first year which will be treated as a part of "on job training".

The following syllabus is based on 6 (six) theory periods and 6 (six) practical periods (of two terms of 3 periods each) per week.

PAPER-V
AQUARIUM

Unit-I : Construction of home and public aquarium, materials used - metal frames, selants, gums, glass sheets, acrilic sheets.

Equipments required, - Tools required, Construction of frameless aquaria.

Unit-II : Setting up of aquarium - gravel/pebbles, plants, ornamental objects and fishes; selection of species. Taxonomy and morphology of freshwater plants. Methods for multiplication of aquarium plants. Clearing the aquarium; maintenance of water quality, common diseases of aquarium fishes, their diagnosis and treatment.

Unit-III : Morphology, Taxonomy and Biology of fresh water ornamental fishes. Maturates, secondary sexual characters, breeding habits, spawning, parental care, fertiliation and development of eggs, Induced breeding, Production of monosex.

Unit-IV : Morphology, Taxonomy of marine ornamental fishes their habitat and collection methods. Transportation of live fish. Other ornamental organisms, enemies, lobsters, shrimps, octopus, starfish their morphology and collection methods.

Unit-V : Nutritional requirements of aquarium fishes. Different kinds of feeds. Culture of fish food organisms. Preparation of dry feeds, feeding methods. Larval feeds and feeding.

PAPER-VI

FISH GENETICS, PRESERVATION, MARKETING AND COMPUTER APPLICATION.

Unit-I : Principles of genetics; gene interactions, mutations, sex determination and control mechanisms, inheritance, inbreeding, selection, hybridization, transgenic fish.

Unit-II : Principle and importance of fish preservation. Traditional and advanced methods of fish preservation - freezing, drying, salt curing, pickling, smoking, chilling, frying and canning.

Unit-III : Processing and preservation of fish products and by products - paste products, minced meat, FPC, fish meal, fish oils, liquid fish, fish hydrolysate, fish sauce, fish glue, pearl essence etc. Edible, industrial and pharmaceutical products from sea weeds.

Unit-IV : Economic principle and their appliction to fisheries. Theory of production, law of diminishing returns. Risks and profits in fisheries. Tradotopma; and commercial fishing operations in marine fisheries and aquaculture. Characteristics of goods, private and public valuation, supply andd demand for fish, Elasticities, Marketing channels.

Economics of fish markets, marketing and resource management. Co-operatives and their role in fish production and markting. Planning and financing schemes for fisheries. Fisheries projects and fish resources.

Unit-V : Objectives and principles of extension education. Fisheries as a tool in rural development. Extension strategies and methodologies.

Flow chart for age & growth, fish production and marketing. Evaluation of co-operatives in fish production and marketing.

Definition of Database file. Creating and opening of database file for fish production, marketing and export values. Maintenance and updating of database file.

Programmes on economics of fish production, fish marketing and resourses management.

PRACTICALS

I. Construction of home aquarium. Preparing the plan for a public aquarium. Fabrication of simple filters and hand nets. Water quality analysis. Setting up an aquarium and its maintenance. Culture of fish food organisms; preparation of aquarium fish feed. Study of common aquarium fish feed. Study of common aquarium fish diseases and their treatment.

II Study of morphological characters of common fresh water and marine ornamental fishes and other ornamental organisms. Maintenance of brood fishes. Breeding, hatching and larval rearing. Induced breeding. Packing and transportation of live fish. Use of sedatives in fish transportation. Collection, identification and multiplication of comon aqurium plants.

III. Practice in the preservation of fish by various methods, preparation and preservation of various products and byproducts. Visit to fish processing plants. Sanitation and quality control exercises.

IV. Study of economics of fishing vessels, esturarine, riverine and culture fisheries. Visits to fish processing units and fish farms to study the economic aspects. Study of fishery development programmes.

V. Visit to villages to popularise fisheries activities and to study field problems. Discussions with fish farmers. Participation in fishing and fish processing activities of government and private agencies employing scientific technology.

VI. DOS; Learning internal and external commands, Creating a database file on capture and culture fisheries. Modifying and updating data.

VII. Developing programes on fish culture, Preparing diet programes based on nutritional requirement of fish in corelation with food conversion ratio.

VIII. Computer statistical graphics on batch composition, sale percentage, growth rate, production, etc.

IX. Compulsory Project Work on computer applicaion, age & growth, fish production, fish marketing, etc.

Practical Examination

Practical examination will be of 12 hours duration spread over two days period and for total 30 marks.

Q.1 Identification of spots I to VII

(Aquarium fishes-2,Aquarium plants-2,Aquarium

	tools-1, Aquarium equipment-1, Aquarium fish food-1)	-	07 Marks
Q.2	Experiment on aquarium fabrication	-	05 Marks
Q.3	Setting of an Aquariumm	-	04 Marks
Q.4	Experiment on Computer graphics	-	04 Marks
Q.5	Project work submitted by Students	-	05 Marks
Q.6	Record and field diary	-	03 Marks
Q.7	Viva voce	-	02 Marks
	Total	-	30 Marks

Equipments and Facilities

I Aquarium tools (one set for four students)
1. Hand drill
2. Hack saw
3. Plier
4. Nose plier
5. Metal cutter
6. Glass cutter
7. Silicon gum
8. Screw drawer
9. Electrically operated drill machine

II Aquarium Equipments (one set for four students)
1. Aquarium heater
2. Areator
3. Aquarium toys
4. Plastic air tube and joints
5. Hand net

III Material for Aquarium fabrication
1. Glass sheets
2. Acrylic sheets
3. Silicon powder and gel
4. Alumminium frame
5. Betumin
6. Wooden and Metal hoods

IV Facilities
1. Cement cisterns (for fish plant propogation)

2. Brood aqarium fishes
3. Glass troughs

V Instruments for fish processing
1. Deep freezer
2. Bucket press
3. Home-canner
4. Pulveriser
5. Strainers
6. Mixer
7. Blender
8. Small sterilization retort
9. Knives
10. Fish dressing table
11. Fish cans
12. Can reformer
13. Seamer

VI Teaching aids (for fishery extension)
1. T.V.
2. V.C.R.
3. Slide projector
4. Overhead projector
5. Public address system
6. Educational cassettes and CDs.

VII Computer, Printer, Scanner.

REFERENCES

1. Guide to tropical fish keeping, 1967. Brymer, J.H.P.Iliffe.
2. Tropical marine acquaria, 1971. Cox,G.F.Hamlyn.
3. Tropical Fish : Setting up and maintaining fresh water and marine aquaria, 1972. Datta R., Octopus Books Ltd.
4. Aquarium Systems, 1981. Hawkins,A.D.(Ed.),Academic Press
5. Living aquarium, 1981. Hunnam, P.Ward Lock.
6. Home acquarium; acquatic gems, tropical fish, 1970. Makino, S.Japan Publications.
7. Aquarium fishes & plants, 1971. Rataj, K. and R.Zukal. Hamlyn.
8. Ornamenntal fish for garden ponds and home aquariums, 1956. Rau, L.P.Home Aquariums.
9. Collins guide to aquarium fishes and plants, 1969. Schiotz, A.Collins.

10. Seawater aquariums, 1979. Spotte,S.John Wiley.
11. Salt water aquarium in the home,1972. Straughan., R.P.L.Thomas Yoseloff.
12. Complete aquarium, 1963. Vogt, D. and H. Wermuth. Thames.
13. Coldwater aquariums and simple outdoor pools, 1970. Wainwright, N.Fredrick Wasne.
14. Guppy:its life cycle, 1974, White,W.Sterling Publications.
15. Encyclopedia of aquarium fishes in colour, 1977. Coffey, D.J.Acro Publiching Company.
16. Freshwater aquarium, 1984. Dawes, J.A.Robert Royce Ltd.,
17. Goldfish, 1981. Hervey, G.F. and J.Hems.Faber & Faber.
18. Freezing preservation of foods. Vol.3, Commercial food freezing operations-fresh foods. Tressler, .K. and others (Eds.),AVI, Conneticut.
19. Fishery by-products technology. Brody, J.AVI, Westport.
20. Laboratory manual for food canners and processors V.I, National Canners Association Research Laboratories AVI, Wastport.
21. Canning technology. Howard A.J.Churchill, London.
22. Fish handling and processing. Burgess. G.H.P. and Others. H.M.S.D.,London.
23. Sausage & Small goods production. Garrard, F.L.Hill, London.
24. Fish curing and processing. Zaiisev,V.Moscow. Mir.Pub.
25. Preservation of fish products by refrigeration, Zaitsev, V.P.Issrael program for scientific translation.
26. Freezing and Irradiation of fish. Kreuzer, R.Fishing nes, London.
27. Chilling of fish. FAO, Ministry of Agriculture & Fisheries, The Hague.
28. Fish inspection and quality control. Kreuzer, R.Ed.,Fishing, New England.
29. Fish Smoking-Torry Kiln Operator's Hand Book. Torry Research Station. H.M.S.O., London.
30. Fundamentals of food canning technology. Jackson & Shinn. AVI Publications, Westport.
31. Fishery Products. Kreuzer,R.(Ed.), Fishing News, England.
32. Practical dehydration. Greensmith, M.Food Trade Press, London.
33. Pickle and sauce making. Binsted, R. and others.(Eds.), Food Trade Press, London.
34. Quality control in fish processing. C.I.F.T.Cochin.
35. Fish processing technology. Govindan, T.K.Oxford and IBH,New Delhi.
36. Introduction to fishery by proucts. Windsor, . and Barlow, Fishing News, Surrey.

37. The Economics of Fisheries Management. Anderson L. 1977. John Hipkins.
38. Food form the sea: The Economics and Politics of Ocean Fisheries. Bell F.,1985. Westview Press.
39. Fishseries Econmics. An introdduction. Cunningham, Dunn and Whitmarsh, 1985, Marsell ST.Martins.
40. Marketing Management. Kothar P. 1988. Prentice Hall, Inc.
41. Aquaculture Econoics Research in Asia. 1982. 193e IRDC, Singapore.
42. Management concepts for small-scale fisheries. Economic and social aspects. Panayotou, T. 1982, FAO, Fisheries Tech. Paper No.228,FAO, Rome.
43. Economics of aquaculture, sea-fishing and coastal resource use in Asia, 1979. Librero, A.R. and W.L. Collier.(Eds.) PCAR.
44. Aquaculture Econoics Research Methos, 1985. AFSSRN Workshop Report No.1, ICLARM, Manila.
45. Economics of aquaculture, sea-fishing and coastal resource use in Asia, 1979, Librero, A.R.and Collier. W.L. (Eds.)PCAR.
46. Agricultural Extension. Gibbons, M.J.and R.Schroder, 1983, Peace Corps Inforation Collection and exchange anual M.18.
47. Agriculture Research and Extension Programme. Bocye J.K. and L.E.Evanson. 1978. Bangkok Agricultural Developent Council Inc.
48. Extension Education. Adivi Reddy, A, 1976. Baptla Sree Lakshmi Press.
49. Some throughts on Argricultural Extension Methods and Community Development Programmes in India. Department of Agriculture in Mysore. Information Booklet No.6, 1959, Repriented in 1971.
50. An introduction to Agricultural Extension, A.T.Mosher, 1978, Agricultural Development Council, New York.
51. Refresher Course in Extension methos and Extension Teaching, 1960. Agricultural College, Hebbal, Bangalore, department of Agriculture, Mysore.

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22. FOOD SCIENCE

The syllabus is based on six theory periods and six practical periods per week.

The examination in food science will comprise of two theory papers and a practical. Each theory paper shall be of three hours duration and carry 60 marks. The practical shall be of 06 hours duration and shall carry 30 marks. The distribution of practical marks shall be as follows:

1.	Record	-	05 marks
2.	Viva-voce	-	10 marks
3.	Exercise	-	12 marks
4.	*Co-curricular Activity Report	-	03 marks
	Total :		30 marks

*"Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

PAPER V

APPLIED FOOD SCIENCE

Unit I : **Food spoilage:** Roles of physical, chemical, biological and microbiological factors in food spoilage. Intrinsic & Extrinsic factors affecting food spoilage.

Unit II : **Basic principles in food preservation.**

Methods of food preservation: Canning Pasteurisation, Sterilisation, dehydration, and concentration, osmosis, freezing, freezedrying and irradiation.

Unit III : **Food additives:** Classification of food additives, Class I & II preservatives. Acidulants, emulsifiers, stabilisers, antioxidants, Sweetners, food colour and favouring agents, gelling & thickening agents.

Unit IV : **Packaging:** Principles of packaging. Functions of packaging materials, Metallic, glass & plastic containers. Flexible packaging, laminated packaging. Testing of packaging materials.

Unit V : **Hygiene Sanitation & Food laws:** Sanitation, hygiene and safety considerations in food industry. Contaminants in foods. Food laws, Role of BIS, Agmark in quality control. PFA,FPO,MMPO, MFPO. Pollution control.

TEXT BOOKS:

1. Food Microbiology by W.C.Frazier, Tata Mc Hill Publishing Co. Bombay.
2. Preservation of fruits & vegetables by Girdharilal & Sidappa, ICAR, New Delhi, 1967.

3. Manual of analysis of fruits & vegetable products by Rangana S., Tata McGraw Hill publishing Co. New Delhi.
4. Foods: Facts & principles by N.Shakuntala Manay and M.Shadaksharaswamy, published by Wiley Eastern Ltd.

PAPER VI

(PROCESSING OF FOODS)

Unit I : **Bakekry & confectionary products:** Milling of wheat. Types of flours, Manufacture of bread, biscuits, cakes, cookies. Manufacture of hard boiled confectionary, caramel, fudge, fondant, chocolate. Traditioanl products such as batasha, chikki, rewadi.

Unit II : **Fruit & Vegetable products:** Various techniques of juice extraction, Canning of juices, fruits in syrup & veg in brines. RTS beverages. Squash. Jam. Jelly. marmalade. Ketchup. Sauce Pickle. Murabba. Dried fruits & vegetables, fruit bars.

Unit III : **Processing of dairy & animal products:** Sources & Composition of milk. Pasteurisation & sterilisation of milk. Sweetened condensed milk. Other dairy products such as Butter, Ghee, Khoa. Paneer, Shrikhand, Pedha, Sources of meat, Cuts of meat. Treatment & canning of meat.

Unit IV : **Fermented foods:** Microbiology & processing of Fermented cereal, legume based foods such as idli, dosa, dhokla, bhatura. Alcoholic beverages such as beer, wine, champagne & whisky. Cheese. Oriental fermented food, tofu, tempeh, Soya sauce.

Unit V : **Speciality foods:** Extruded snacks, soyabased meat analogues, Malted weaning foods, Infant food. Ready to eat precooked foods, instant foods, ready mixes. Low calorie foods, High protein foods, Single cell protein. eg.spirullina, mushroom.

TEXT BOOKS:

1. Preservation of fruits & vegetables by Girdharilal & Sidappa, ICAR, New Delhi, 1967.
2. Manual of analysis of fruits & vegetable products by Ranaganna S., Tata McGraw Hill publishing Co.New Delhi.
3. Modern dairy products by Lampert I.M., Eurasia publishing House Ramnagar New Delhi. 1970.

4. The meat handbook by Levie A. AVI publishing Co.Connecticut 1970.
5. Foods: Facts & Principles by N.Shakuntala Manay and M. Shadaksharswamy, published by Wiley Eastern Ltd.
6. Cereal Technology by Matz S.A.,AVI publishing Co.Inc.Westport connecticut.

PRACTICAL

1. Estimation of gluten in flour.
2. Preparation of bread & biscuits.
3. Preparation of chikki, fudge/caramel.
4. Preparation of squash.
5. Preparation of jam.
6. Preparation of paneer.
7. Preparation of khoa based sweet.
8. Preparation of malted weaning food.
9. Preparation of raisin from grapes.
10. Estimation of sugars, acidity & SO2 in Squash.
11. Estimation of fat in milk.

LIST OF RECOMMENDED APPARATUS FOR A BATCH OF 16 STUDENTS

1.	Thermometers. 0-110 oC		10/Batch
2.	Thermometers. 0-360 oC		10/Batch
3.	Silica crucibles.		16/Batch
4.	Sintered glass crucibles.		8/Batch
5.	Filteration flask with buchner funnel.	250 ml.	8/Batch
6.	Seperating funnel.		4/Batch
7.	Microscopic slides/coverslips.		6 doz/Batch
8.	Test tubes.		16 doz/Batch
9.	Pippettes. Vol-	10 ml.	16/Batch
		25 ml.	16/Batch
10.	Pippettes. Graduated-	10 ml.	16/Batch

		5 ml.	16/Batch
		1 ml.	1/Batch
11.	Burrettes.	50 ml.	16/Batch
12.	Petridishes.		3 doz/Batch
13.	Vot Flask	100 ml.	18/Batch
14.	-do-	250 ml.	18/Batch
15.	-do-	500 ml.	4/Batch
16.	Conical Flask	250 ml.	36/Batch
17.	-do-	100 ml.	36/Batch
18.	Measuring cylinder	100 ml.	18/Batch
19.	Measuring cylinder	250 ml.	4/Batch
20.	Measuring cylinder	500 ml.	4/Batch
21.	Wash bottle	500 ml.	16/Batch
22.	Vernier Caliper (Digital)		1
23.	Lactometer		2
24.	Butyrometers		1 set

LIST OF RECOMMENDED EQUIPMENT FOR A BATCH OF 16 STUDENTS

1.	Hot air oven.	2/Batch
2.	Incubator microbiological	1/Batch
3.	Quickfit Nitrogen digestion/distillation assembly (set of six)	1/Batch
4.	controlled Temp.waterbath.	3/Batch
5.	Analytical balance. (Digital preferred)	4/Batch
6.	Weight box.	10/Batch
7.	Dessicators.	16/Batch
8.	Magnetic stirrer.	3/Batch
9.	Water Suction.	8/Batch
10.	Photoelectric colourimeter.	1/Batch
11.	pH meter.	2/Batch
12.	Centrifuge machine electrically operated.	one

13.	Water Deioniser/Distilled water still.	2/Lab
14.	Heating mantle.	4/Batch
15.	Inoculation needles.	5/Batch
16.	Microscopes with 10x,45x & 90-100x objective monocular.	6/Batch
17.	Colony counter.	1/Batch
18.	Laminar air flow chamber.	1/Batch
19.	Bunsen burners.	16/Batch
20.	Test tube stands. 12 tubes.	16/Batch
21.	Tripod stands.	20/Batch
22.	Burrette stands.	20/Batch
23.	Autoclave Portable Nonelectric	2/Batch
24.	Refrigerator.	1
25.	Triple Beam Balance 100 gm capacity	1/Batch
26.	Mixer/Food processor.	1/Batch
27.	Gerber centrifuge with test tube	one set.

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23. COMPUTER MAINTENANCE

(Vocational)

(Revised Syllabus implemented from the session 2007-08)

The examination in Computer Maintenance will comprise of two theory papers and one practical. Each theory paper will be of three Hrs. duration and carry 60 marks. The practical examination will be of 6 Hrs. duration and carry 30 marks.

Each unit of theory paper will carry two questions with internal option to solve any one question.

The syllabus is based on six theory periods & 6 practical periods per week. Candidates are required to pass separately in theory & practical, with 4 week on the job training.

Distribution of practical marks are as follows.

1.	Practical based on Computer Lab-I	10 Marks
2.	Practical based on Computer Lab-II	10 Marks
3.	Viva-Voce on 1 & 2	6 Marks
4.	Record / Practical Journal on job training report	4 Marks
	Total :	30 Marks

PAPER-V

(DATA COMMUNICATION, NETWORKING & INTERNET)

Unit-I : **Data Communication & Networks :** Introduction, History, Definition, Components of communication network.
Future trends. Network Applications : Groupware, E-mail, Group support systems, Video conferencing.
Information superhighway, Internet.

Unit-II : **Fundamentals & Data Communication & Networking :** Telephone Communication, Voice Communication.
Area Codes, Switches : Circuit switching, Digital switching, Network switching, PBX benefits, Cellular technology.
FAX, ANI, IVR.

Unit-III : **Data Communication H/W :** Network Architectures, Hosts, Clients, Circuit network configuration, Media.
Communication devices, Digital transmission concept, Analog transmission concept, use of MODEM.
Digital transmission of Analog data.

Unit-IV : **Network Architecture :** Layered architecture, OSI model, MAC, Protocols, Topology.
Network component : Hubs, Switches, Routers, Gateways, Laget, Ethernet, FDDI, Servers, Server H/W, Network security.

Unit-V : **Internet :** History, Growth, Owner, Anatomy, TCP/IP, IP address, Types of networks, LAN, WAN, C/S.
Connectivity, www introduction, Servers, Browsers, http, IE, NN, Bookmarks, Cookies, E-mail, FTP.
Telenet, Web publishing.

Books Recommended :

1. Internet & Web Design - MacMillan.
2. Computer Networking - Ross
3. Business Data Communication & Networking (fifth edition) - Fitzerland & Dennis.

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PAPER-VI

(PC MAINTENANCE & TROUBLE SHOOTING)

Unit-I : **Microcomputer System & Peripherals :** Computer Organization, Character & numbers, Codes, Memory, ALU.
CU, IF, Interrupts, I/O, Device controllers, Error detection, MP, PC, K/B, CRT, Printer, Magnetic storage.
Devices (FD, HD, MTD, OD), Special peripheral.

Unit-II : **IBM PC H/W overview :** Introduction (BIOX, DOS), PC family & H/W, System's box, M/B, I/O & Interrupts, DMA, Peripherals interface & Controller, K/B interface, Parallel & Serial interface, CRT controller, FDC, HDC, Memory Refresh, POST.

Unit-III : **Motherboard :** Dump & Smart chips, Role of 8284, 8288, 8259, & 8253, PPI 8255, Function of 8237, Functional units of M/B & its inter communication, Working of FDC, HDC, Display & K/B controller.

Unit-IV : **PC installation & Preventive Maintenance :** Introduction, Planning, Practice, Routine checks configuration, Upgradation, Maintenance, System usages.

Unit-V : **Trouble Shooting :** Introduction, Computer faults, Nature & Types, Diagnostics, Fault elimination process, Systematic trouble shooting, Diagnosis & Rectification of FDC, HDC, Monitor M/B, K/B, Printer.

Books Recommended :

1. IBM PC & Clones - Govindrajalu.
2. IBM PC Trouble shooting & Maintenance - Brenner.
3. ABC of IBM PC - Peter Norton.

Practicals :

Computer Lab-I : Based on syllabus of Paper-I (min. 10 experiment)

Computer Lab-II : Based on syllabus of Paper-II (min.10 experiement)

LIST OF EQUIPMENTS/SOFTWARES

1.	(a) Oscilloscopes (15/20 Hrs.)	-	3 Nos.
	(b) Oscilloscope (100 Hrs.)	-	1 No.
2.	Power Supplies	-	4 Nos.
3.	Digital and Analogue Multimeter	-	10 Nos.
4.	Bread Boards	-	10 Nos.
5.	Microprocessor Kit / Mother board	-	4 Nos.
6.	Digital IC Tester	-	2 Nos.
7.	PC (80286, 8086 XT) Trainer Kits	-	3 Nos.
8.	Printer	-	2 Nos.
9.	Diagnostic Cards (as per syllabus)	-	4 Nos.
10.	P.C. with current configuration	-	2 Nos.
11.	Add-on Cards (as per syllabus)	-	4 Sets
12.	Monitor	-	3 Nos.
13.	SMPS	-	2 Nos.
14.	UPS	-	2 Nos.

15.	CVT	-	4 Nos.
16.	Function Generator	-	2 Nos.
17.	Logic Probes	-	2 Nos.
18.	Virus Cards/Filter	-	2 Nos.
19.	HDD	-	2 Nos.
20.	Floppy Drives	-	4 Nos.
21.	MASM Assembler (S/W)	-	2 Nos.
22.	MS-DOS, UNIX & NOVEL (S/W)	-	1 No.
23.	Computer Unit	-	2 Nos.
24.	Antistatic Mat, Wrist Band	-	1 No.
25.	Vac. Cleaner	-	1 No.
26.	Computer Spares & Cards related to syllabus	-	2 No Each
27.	Licensed Softwares related to Syllabus & General functionality.	-	1 No. Each

24. BIOTECHNOLOGY (Regular/Vocational)

(Effective from the session 2003-2004)

The syllabus is based on six theory periods and six practical periods per week.

The Examination shall comprise of three theory papers and one practical. Each paper is divided into five units. There shall be one question on each unit with internal choice. Examinee shall attempt all five questions. Each theory paper shall be of three hours duration and carry 40 marks. The practical examination shall be of six hours duration and carry 30 marks.

PAPER-VII

ANIMAL CELL BIOTECHNOLOGY

Unit-I History of development of cell cultures, the natural surroundings of animal cells, Metabolic capabilities of animal cells, Simulating natural condition for growing animal cells, Importance of growth factors of the serum, Primary cultures. Anchorage dependance of growth. Non-anchorage dependent cells,Secondary cultures. Transformed animal cells -Established/continous cell lines.Commonly used animal cell lines - their origin and characteristics. Growth kinetics of cells in culture.

Unit-II Applications of animal cell culture for studies on gene expression. Organ culture. Transfection of animal cells : Selectable markers, HAT selection, antibiotic resistance etc. Cell fusion. Transplantation of cultured cells and Differentiation of cells.

Unit-III General metabolism:

Special secondary metabolites/products (Insulin, Growth hormone, Interferon, t-plasminogen activator,factor VIII etc.) Expressing cloned proteins in animal cells. Over production and processing of chosen protein.

Unit-IV Production of vaccines in animal cells. Production of monoclonal antibodies. Growth factors, promoting proliferation of animal cells(EGF,FGF,PDGF, IL-1, IL-2, NGF, Erythropoietin etc.)

Unit-V Enterpreneurship -

Basic regulations of excise, survey the demand for a given biotechnological product, feasibility of its production under the given constraints, project preparation for financial assistance, Different funding agencies, subsidies for various projects. Patenting the product.

PAPER-VIII
PLANT BIOTECHNOLOGY

Unit-I Tissue culture, introduction & histroy, sterilization of glassware, surface sterilization, media preparation and composition, totipotency & cell suspension culture. Use of growth regulators.

Unit-II In vitro techniques in tissue culture.Beginning of in vitro cultures, Induction of callus, ovary and ovule culture, in vitro pollination and fertilization. Embryo culture, embryo rescue after wide hybridization, and its applications. Introduction to the processes of embryogenesis and organogenesis and their practical applications.

Clonal multiplication of elite species (Micropropagation) from axillary bud, shoot-tip and meristem culture.

Unit-III Pollen, anther culture, for haploid production, somaclonal variations and its applications. Endosperm culture and production of triploids. Practical applications of tissue and organ culture.

Single-cell suspension cultures and their applications in selection of variants/mutants with or without mutagen treatment.

Unit-IV Introduction to protoplast isolation : principles and applications.

Testing of viability of isolated protoplasts & its regeneration. Somatic hybridization - an introduction. Various methods for fusing protoplasts.

Unit-V Use of markers for selection of hybrid cells.

Practical applications of somatic hybridization (hybrids and cybrids)

Use of plant cell, protoplasts and tissue culture for genetic manipulation of plants. Introduction to Agrobacterium tumefaciens. Tumor formation on plants using A. tumefaciens (Monocots and Dicots). Root-formation using A. rhizogenes.

Practical application of genetic transformation.

PAPER-IX
ENVIRONMENTAL BIOTECHNOLOGY

Unit-I Renewable and non-renewable resources : Bioassimilable/ biodegradable.

Major consumer items : Food, fuel and fibres.

Conventional fuels and their environmental impacts : Firewood, Plant and animal wastes, Coal, Gas, and Animal oils.

Unit II Modern fuels and their environmental impacts :

Methanogenic bacteria and biogas, Microbial hydrogen production. Conversion of sugars to ethanol, Solar energy converters, Hopes from the Photosynthetic pigments. Cellulose degradation for combustible fuel. Green house effect.

Biotechnological inputs in producing good quality natural fibres.

Transgenic sheep, transgenic plants and their environmental implications.

Unit-III Microbiological quality of food and water.

Treatment of vegetable, municipal waste and industrial effluents.

Degradation of pesticides and other toxic chemicals by micro-organisms.

Unit-IV BT toxin as a natural pesticide.

Biological control of other insect- pests and weeds. Leaching of ores by micro-organisms. Biofertilizers.

Unit-V Bioremediation, General idea of xenobiotics, oils, Petroleum degradation by microbes. Role of genetically modified microbes in combating pollution, Application of microbes in revegetation of mine-areas.

PRACTICALS

1) Initiating plant tissue culture: (dedifferentiation of explants)
2) Growth of plant cells into undifferentiated mass.
3) Large scale cultivation of plant cells in suspension.
4) Induction of differentiation by modulating the hormonal balance.

5) Embryo culture from various systems.
6) Organogenesis from different types of explants.
7) In vitro Pollen and anther culture
8) Separation of cells by trypsinization.
9) Testing of viability of trypsinized/isolated cells.
10) Preparation of primary culture from chick embryo.
11) Maintenance and subculturing of cell lines.

PROJECT WORK

The Students will be assigned to generate data on certain research projects and/or compile available information from literature on a given topic of biotechnological relevance. The project work will be completed under the supervision of faculty members.

PRACTICAL EXAMINATION

TIME : 6 HRS		MARKS : 30
1)	To perform one major experiment	10
2)	To perform one minor experiment	05
3)	Viva-Voce	05
4)	Practical record	05
5)	Project report	05
	Total	30

Note : Major and minor experiment shall be decided by the internal examiner.

Books Recommended:

1. Animal Cell Biotechnology (Vol. I & II): R.E.Spier and J.B.Griffiths.
2. Animal Biotechnology : Murray Moo - Young
3. Animal Cell Culture - Practical Approach : R.I. Freshney
4. Microbiology : B.D.Davis, R.Dulbecco, H.N.Eisen, & H.S.Ginsberg
5. Basic Biotechnology : Rev.Fr.Dr.S.Ignacimuthu
6. Molecular Biology & Biotechnology : H.D.Kumar
7. Text Book of Biotechnology : G.R.Chhatwal
8. A Text Book of Biotechnology : R.C.Dubey
9. Modern Biotechnology : S.B.Primrose
10. Environmental Biotechnology : G.S.Omen
11. Biotechnology : Trehan K.
12. Fundamentals of Biotechnology : S.S.Purohit and S.K.Mathur
13. Plant Cell, Tissue and Organ Culture : (Ed.) J.Reinert and Y.S.P.Bajaj.
14. Plant Cell, Tissue and Organ Culture : (Ed.) O.L.Gamberg & G.C.Phillips

15. Biotechnology and Environment : R.N.Trivedi
16. Elements of Biotechnology : P.K.Gupta

LIST OF INSTRUMENTS, EQUIPMENTS WITH SPECIFICATION REQUIRED FOR B.Sc.I,II AND FINAL BIOTECHNOLOGY.

SR.No.	NAME	MAKE
1.	pH Meter	Systronics/Elico J.Mitra/ any std. make
2.	Autoclave a.Portable	Yarco/Wiswo or any Std.make
3.	Incubator	Yarco/Tempo/Lab. Hosp.or any std.make
4.	Hot air oven	Yarco/Tempo/Lab.Hosp.or any Std.make
5.	Environmental Growth chamber	
6.	Laboratory Shaker/Platform Shaker	
7.	Colorimeter	Erma/Elicol Systronics or any std.make
8.	UV-Vis spectrophotometer	
9.	Tissue culture racks with illuminators.	
10.	Verticle & horizontal electropherosis apparatus with power pack	Genei/any std.make
11.	Single pan electrical balance	Systronics/K.Roy contac or any std. make
12.	Cyclo-Mixer	Remi/Tempo/or any std.make
13.	High Speed cooling centrifuge/with micro centrifuge rotor. Remi C24 + 10X16 ml rotar + 4X100 ml rotar.	
14.	UV Transilluminator/UV torch, Male Genei/Fotodyne with dual lamps.	
15.	Computer with Internet facility,	
16.	Microscope a Monocular	Olympus/Metzer/Labo.or any other std.make

17.	Oil Immersion lens (preferabley Imported)	Olympus/Meopta Labo/or any std. make
18.	Serological Water bath	Yarco/Tempo/Lab Hosp or any std.
19.	Laminer Air-flow (Hozt.) (to be installed in Asceptic room)	Micro filt/or any std.make
20.	Refrigerator	Godrej/Kelvinator/BPL/or any std. make
21.	Over head Projector	Metzer/photophone or any std.make
22.	Automatic Pipette Washer	Kumar/Modern or any std.make
23.	Membrance Filter Assembly	Yarco/Tempo/or any std.make
24.	Magnetic Stirver with hot plate	-"-
25.	Glass distillation assembly	NPL or any other std. make.
26.	Mixer	Sumit / Jyoti or any other std. make.
27.	Rotary shaker	Yarco/Tempo/Remi or any other std. make.
28.	B.O.D. Incubator	Toshiba / Yarco or any other std. make.
29.	Epidiascope	Metzer/Photophone or other std. make
30.	Slide Projector	Metzer/Photophone or other std. make.

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25. INDUSTRIAL MICROBIOLOGY

(Implemented from the session 2006-07)

The Examination in Industrial Microbiology shall comprise of two theory papers and one practical. Each theory paper is divided into five units. There shall be one question from each unit with internal choice. Examinee shall attempt all five questions. Theory paper shall be of three hours duration and carry 60 marks each. Practical examination (each batch of 16 students) will last for at least two consecutive days with minimum four working hours each day. The syllabus is based on six theory periods and six practical per week.

PAPER V
(INDUSTRIAL BIOTECHNOLOGY)

UNIT I: - TOOLS & TECHNIQUES OF GENETIC ENGINEERING:

a) Preparation of pure samples of DNA, enzymes for splicing, range of DNA manipulating enzymes, analysis of DNA fragment size, joining

of DNA molecules, vectors and their types.

b) Introducing DNA into host cell, competent cells, transduction of cells, and identification of transformed cell. Selection of clones, direct and indirect methods.

c) Definition and application of gene mapping, DNA sequencing and PCR.

d) Introduction to expression of cloned gene, construction of gene library cells for cloning. Expression of prokaryotic and eukaryotic genes.

UNIT II: - GENETIC TECHNIQUES IN STRAIN IMPROVEMENT:

a) Mutation and selection of different types of mutants e.g. Auxotrophic, antibiotic resistant, analogue- resistant mutants. Mutants resistant to feedback effect and toxic compounds. Isolation of revertant mutants (Ames Test)

b) Protoplast fusion and its applications.

UNIT III: - GENE MANIPULATION AND EXPRESSION

a) Cloning vehicles – Plasmid, Cosmids & Bacteriophage.

b) Genomic DNA libraries, cDNA cloning

c) Recombinant Selection & Screening method – Nucleic acid hybridization method

d) Expression of cloned DNA fragments in Prokaryotes & Eukaryotes

Unit IV: - Interaction with DNA

a) DNA Sequencing

b) Polymerase chain reaction- Primers, cloning PCR Product, RT-PCR & other modifications

c) Site directed mutagenesis & its applications.

Unit V: - Health care industrial products

a) Production of hormones- Insulin

b) Production of interferon

c) Production of vaccines – Recombinant Hepatitis vaccine.

d) Hybridoma technology & monoclonal antibodies.

e) Gene therapy.

f) SCP (Single Cell Protein)

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PAPER VI
TISSUE CULTURE & INDUSTRIAL WASTE MANAGEMENT

UNIT I – ANIMAL TISSUE CULTURE

1) Introduction, Definition of terms – Tissue culture, Cell culture, Organ culture. Primary, Secondary, Continuous & Established Cell lines.

2) Uses of Cell lines.
3) Cell culture products
4) Advances in animal tissue culture

UNIT II – PLANT TISSUE CULTURE

1) Introduction – Pleuripotency of plant cells, growth factors, nutrient media, propagation & preservation of plant tissues.
2) Callus Culture - Isolation & Culturing techniques.
3) Regeneration
   a) shoot regeneration
   b) somatic embryogenesis
4) Types of plant tissue culture
   a) Anther culture
   b) Ovary culture
   c) Meristem culture
   d) Embryo culture
5) Somatic hybridization.

UNIT III – WASTE MANAGEMENT

1) Physical, Biological & Chemical methods for treatment of industrial effluents
2) Solid waste management (outline). Biogas production.
3) Composting

UNIT IV –

1) Bioremediation – outline
2) Role of microbes in a) Degradation of crude oil b) Bioleaching of metals c) Recovery of metals
3) Production of Biofertilisers & Biopesticides.

UNIT V – ENTREPRENEURSHIP

Basic regulations of excise. Survey the demand for a given microbial product, feasibility of its production under the given constraints, project preparation for financial assistance, different funding agencies. Subsidies for various projects, patenting the product.

Practicals

1) Preparation of various media for Tissue culture.
2) Development of Callus Culture.
3) Plant Regeneration from Callus Culture.
4) Organogenesis from different types of Explants.

5) Protoplast Fusion.
6) Electrophoresis – Agarose Gel.
7) Isolation of Genomic DNA & Plasmid DNA.
8) Estimation of DO, BOD, COD of different industrial effluents.
9) Visit to Industrial effluent treatment plant, Dairy; Food processing industry etc.
10) Study tour.

List of books recommended:

1) Old, S.B. Primrose. (1994) Principles of Gene Manipulations, Blackwell Scientific Publications.
2) Brown T.A. Gene Cloning- An Introduction, Chapman and Hall India.
3) Brown (1991) Essential Molecular Biology – A practical Approach Vol I & II, Oxford University Press.
4) Freshney, R.I (ed), 1992, Animal cell culture: A practical approach (2nd ed), Oxford University Press, New York.
5) Freshney, R.I 1987, Culture of animal cells: A Manual of basic techniques (2nd ed), Alan R. Liss, New York.
6) Paul, J., 1975, Cell and Tissue culture (5th ed) Livingstone, Edinburgh.
7) Bhojwani, S.S., (ed) 1990, Plant Tissue Culture: Application and Limitations, Elsevier, Amsterdam.
8) Street, H.E., 1977, Plant cell and Tissue Culture, Blackwell, London.
9) Davar R.S, Principles and Practice of Management.
10) Jain and Agarwal, Production Management and Industrial Organization.
11) Sherlekar, S.A., Marketing / Management.

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11.	8	Environmental Science	47
12.	9/10	Industrial Chemistry (Regular/Vocational)	54
13.	11	Petrochemical Science	59
14.	12	Physics	66
15.	13	Chemistry	75
16.	14	Botany	88
17.	15	Zoology	95
18.	16	Electronics (Instrumentation)	103
19.	17	Biological Techniques & Specimen Preparation (Vocational)	111
20.	18	Instrumentation (Vocational)	114
21.	19	Seed technology (Vocational)	121
22.	20	Computer Application (Vocational)	130
23.	21	Industrial Fish & Fisheries	134
24.	22	Food Science	140
25.	23	Computer Maintenance (Vocational)	145
26.	24	Biotechnology (Regular/Vocational)	148
27.	25	Industrial Microbiology	153
28.	26	Bioinformatics	157

NOTIFICATION

No. : 54 / 2009 Date : 06 / 04 / 2009

Subject : Continuation of Prospectus No.2009123 of B.Sc. Final for the Session 2009-10.

It is notified for general information of all concerned that the Prospectus No.2009123 prescribed for B.Sc. final examination for the session 2008-09 shall be continued for B.Sc. final, Summer-2010 examination i.e. for the Session 2009-2010 with following addition.

I) On page No.96, the following books be added at Sr.No.19 in the list of recommended books for the subject Zoology.
"19. A text book of Evoluation by Dr.D.S.Dabhade, Dr.I.A.Raja, Dr.R.A.Gulhane, Dr.A.P.Charjan, A.K.Patki, Dr.P.S.Patil, published by Sanket Publication, Washim."

II) The distribution of practical marks printed on page Nos. 8, 16, 29, 38, 43, 50, 65, 74, 92, 98, 102, 127 and 139 for the subjects Geology, Statistics, Microbiology, Biochemistry, Computer Science, Environmental Science, Physics, Chemistry, Botany, Zoology, Electronics (Instrumentation), Seed Technology and Food Science be substituted by the revised distribution of marks for practical as shown under Appendix-A appended with this notification.

Sd/-
(J.S.Deshpande)
Registrar

Appendix-A

DISTRIBUTION OF PRACTICAL MARKS (GEOLOGY)

		Marks
A]	a) Aerial photo & satellite imageries interpretation	4
	b) Morphometric analysis	3
	c) Structural geology problems	3
	d) Section drawing	4
	e) Hydrogeology problems	3
	f) Exploration problems	3
B]	Sessional + practical records	2
C]	a) *Co-curricular Activity Report	3
	b) Field work	3
	c) viva	2
	TOTAL	30

* "Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (STATISTICS)

Revised practical marks schedule of B.A./B.Sc. Final year Statistics as below.

1)	Practical Record 04 Marks	
2)	Viva-Voce	05 Marks
3)	Practical Problem	18 Marks
4)	*Co-curricular Activity Report	03 Marks
	Total:	30

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (MICROBIOLOGY)

		Marks
1.	Phosphatase/Methelene blue reduction test Curd Micribiology/Estimation of fat in milk	03
2.	MPN/IMVIC/BOD/MFT standard test for coliform	03
3.	SPC of milk/foods/fruits/canned food	05
4.	Estimation of alcohol/citric acid/isolation of azotobacter/rhizobium/paper chromatography	05
5.	Spotting	05
6.	Viva	04
7.	*Co-curricular activity report	03
8.	Class record	02
	Total:	30

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (BIOCHEMISTRY)

	Marks
Q.1. Long Experiment	
One Experiment for either Section A/D/E	10
Q.2. Short Experiment-I	
One Experiment from section B	04
Q.3. Short Experiment-II	
Qne Experiment from section C	04
Q.4. Record,classwork & Internal Assessment	04
Q.5. Viva	05
Q.6. *Co-Carricular Activity Report	03
Total:	30

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (COMPUTER SCIENCE)

(1) Experiment Programme	09 Marks
(2) Experiment Programme	09 Marks
(3) *Co-curricular Activity Report	03 Marks
(4) Viva-Voce	05 Marks
(5) Record	04 Marks
Total:	30

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (ENVIRONMENTAL SCIENCE)

Following Change in the Distribution of Marks for Practical Examination In Question No.4 & 5 of Existing Syllabus Of B.Sc.Final Year (**Env.Science**) On Page No.51. As Given Below:

"Q4.	Class Record + Viva-Voce	- 5 Marks
Q5.	*Co-Curricular Activity Report	- 3 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (PHYSICS)

1.	Experiment (two experiment)	16 marks
2.	Sessional work	05 marks
3.	Viva Voce (3 for each expt.)	06 marks
4.	*Co-curricular Activity Report	03 marks
TOTAL :		30 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (CHEMISTRY)

a)	Inorganic Chemistry (Exercise)	7 Marks
b)	Organic Chemistry (Exercise)	7 Marks
c)	Physical Chemistry (Exercise)	7 Marks
d)	Record	3 Marks
e)	Viva	3 Marks
f)	*Co-curricular Activity Report	3 Marks
TOTAL:		30 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (BOTANY)

Following Change in the Distribution of Marks for Practical Examination In Question No.7 of Existing Syllabus Of B.Sc.Final Year (**Botany**) On Page No.92. As Given Below:

" Q7.	Class Record + Viva-Voce	- 3 Marks
Q8.	*Co-Curricular Activity Report	- 3 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discus-

sion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (ZOOLOGY)

Time: 4 hrs.		**Marks**
1)	Iidentification, classification & comment on spot (fish,aquatics weeds, insects or panktons) 1 to 5	5
2)	Dissection of fish/prawn/insect life cycle.	4
3)	Microtechnique	
	a) section cutting & spreading of ribbons	4
	b) staining of the given slide	3
	c) camera lucida drawing of the given object	3
4)	Permanent slides submitted by the examinee (5 slides)	2
5)	Class record (duly signed by teacher incharge and certified by head.)	2
6)	Collection of Animals	2
7.	Viva-voce	2
8.	*Co-curricular Activity Report	3
	Total :	30 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (ELECTRONICS (INSTRUMENTATION))

1.	One Expt.	09 Marks
2.	Practial record	03 Marks
3.	Viva on Expt.	03 Marks
4.	Project (Experimental)	09 Marks
5.	Project report	03 Marks
6.	*Co-curruculer Activity Report	03 Marks
	Total:	30

***** "Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (SEED TECHNOLOGY)

Following change in the Distribution of Marks for Practical Examination in question No.6 of existing syllabus of B.Sc.Final Year (**Seed Technology**) on Page No.127. as given below:

"Q6.	Class Record + Viva-Voce	- 7 Marks
Q7.	*Co-Curricular Activity Report	- 3 Marks

*** "**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

DISTRIBUTION OF PRACTICAL MARKS (FOOD SCIENCE)

		Marks
1.	Record	05
2.	Viva-voce	10
3.	Exercise	12
4.	*Co-curricular Activity Report	03
	Total:	30

* **"**Co-curricular Activity Report" which mean the report on the activity such as Seminar, Study Tour, Industrial visit to Research Institute, Group Discussion, Excursion Tour to be submitted by the students at the time of practical examination.

Sd/-
Registrar
Sant Gadge Baba
Amravati University

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26. BIOINFORMATICS

The examination shall comprised of 3 theory papers and one practical. Each theory paper shall be of 3 hours duration and carry 40 marks. The course is based on 6 theory periods and 6 practical periods per week.

Paper VII
Methods in Bioinformatics

1. Biology and Computer Science :-

   The Organization of DNA. The Organization of proteins. *In silico* analysis of primary structures of proteins and nucleic acid sequences. Limitation of Computation Analysis. Representing sequence Data , a program to store a DNA sequence, DNA Fragments, Transcription : DNA to RNA

2. Perl and Programming :-

   Low and long learning curve. Perl's benefits. Installing Perl on computer. Perl program peration text editors. Finding help. Individual approaches to programming Edit-Run-Revise (and Save) An environment of programs, programming strategies. The programming process using the Perl. documentation calculating the reverse complement in Perl Proteins, files and arrays reading proteins in files arrays scalar and list context. Subroutines scoping and subroutines command-line arguments and arrays. Passing data to subroutines modules and libraries of subroutines fixing bugs in code.

3. Mutations, Randomization and genetic code :-

   Random number generators. A program using randomization. A program to simulate DNA mutation generating random DNA analyzing DNA. The genetic code. Hashes data structures and algorithms for biology. Translating DNA into proteins. Reading DNA from files in FASTA format reading frames.

4. Restriction Maps and Regular Expression :-

   Regular expression restriction maps and restriction enzymes Perl operations GenBank, GenBank files, GenBank libraries, separating sequence and annotation, parsing annotations indexing GenBank with DBM.

5. Protein Data Bank :-

   Protein Tertiary structure prediction methods: Homology modeling, fold recognition, Abintio Method. Comparison between and tertiary structure. Files and Folders PDB files parsing PDB files controlling other programs.

   HMM (Hidden Marcov Model) : Introduction to HMM, its application in sequence alignment and structure prediction, based Softwares (HMMER and HMMSTR) obtaining BLAST String Matching and Homology, BLAST output files, parsing BLAST output presenting data bioperl.

Recommended Books :-

(1) James Tisdall, 2001, "Beginning Perl for Bioinformatics", O'Reilly & Associates (2001), Learning Perl, 3rd Edition.
(2) Bioinformatics and Functional Genomics – Jonathan Persner
(3) S.C.Rastogi, Namita Mendirata, Parag Rastogi, "Bioinformatics concepts skills and application, CBS Publisher.
(4) D.Baxevanis and F.Oulette, (2002), "Bioinformatics : A practical guide to the analysis of genes and proteins", Wiley.
(5) Arthur M. Lesk, (2002), "Introduction to Bioinformatics", Oxford University.

Practicals :

1. Downoading primary structure of nucleic acids and proteins.
2. Protein Sequence comparison and analysis
3. Properties of primary structure of proteins using online tools.
4. *In silico* analysis of nucleic acids and proteins tools.
5. Installing perl and command lines arguments.
6. Access to Gene and Protein data bank.
7. Prediction of secondary structure of proteins.
8. Visulazation of tertiar structure of proteins in Rasmol or Cn3d.

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Paper VIII
Advanced Bio-computing

UNIT-I : Object Oriented Programming using C++ :
Introduction to OOPS, features, structure, data types and user defined database, Constants, variables, operators, control statements, creating and writing functions, inline functions and function overloading.

UNIT-II : Classes & Objects :
Data abstraction, encapsulation, data hiding, defining class, member functions and data members, creating objects, accessing class members, constructors, destructors, array of objects, pointer to objects, operator overloading, inheritance and its types.

UNIT-III : RDBMS ORACLE 9i :
Architecture, Database models : Relational, Hierarchical, Networks; data dictionary, DMI operations, Domains and attribuetes, normalization process, Normal forms : 1NF, 2NF, 3NF, 4NF, BCNF. SQL : Components of SQL, data types and operators. DDL Commands : CREATE, ALTER, DROP, for tables and views. DML Commands : SELECT, INSERT, DELETE, UPDATE, BREAK & COMPUTE.

UNIT-IV : Functions
Number, Character, Concatenating functions, joins, unions, data integrity and constraints. PL/SQL : Features, Block structures, variables, constants, data types, control structures, cursor, concept, type, opening, declaring, classify and censor attributes.
Transactions : Rollback, commit, save point, Rollback segment.

UNIT-V : Features of SQL form of SQL report :
Users, Roles and Privileges : Concept, creating users, system and object previlage, GRANT privilege, REVOKE privilege, passing on privileges, creating roles.

Recommended Books :

1) Object Oriented Programming with C++ : E.Balaguruswamy
2) Programming with C++ : R.S. Nisar Ali
3) Mastering C++ : Venugopalan.
4) C++ Programming : Ravi Chandran
5) Understanding Oracle : Perry and Latic – BPB
6) Essentials of oracle 8 : TOM Lewis.
7) An Introduction of Data Base Systems : C.J.Date – Narosa
8) Programming with C++ : Robert Lafore
9) Oracle Press Introduction to oracle (TMH)
10) Oracle Unleashed (Sams)

Practicals :-

Minimum 16 experiments based on theory paper covering all aspect of syllabus.

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Paper IX

Biological Databases and Databanks

UNIT-I : Introduction to Database :
Importance of Database,
Types of Database,
Data Models,
Data Abstraction,
Test Databases.

UNIT-II : Database Design and Management :
Database Design (DBMS & RDBMS),
Data Security,
Data Warehousing, capture and Analysis,
Data Management and Architecture.

UNIT-III : Biological Databanks :
Introduction to Biological databanks,
Nucleic Acid Sequence databanks : GenBank,
Protein Sequence databanks : PDB, SRS, SWISSPROT,
Genomic Databases.

UNIT-IV : Database Similarity Searches :
BLAST,
FASTA,
PSI-BLAST,
BLAST-2

UNIT-V : Bioinformatics Databases and Repositories :
Microarray Database,
Enzyme Database,
Biodiversity Database,
Repositories : EST and STS.

List of Experiments :-

(1) Accessing existing databases on www.
(2) Homology search tools like BLAST.
(3) Database Searches : NCBI, DDBI, EMBL, Uniprot.
(4) Parremire sequence alignment – BLAST.
(5) Downloading and installing software/plugs in windows.
(6) Spreadsheet Applications : (Database Management Sorting Records, finding, adding, deleting.)

List of Books :-

(1) Baldi P. and Hatfield G.W. (2002), DNA Microarray and gene expression. Cambridge University Press, U.K.
(2) Bowtell D. and Smbrook J. (2003), DNA Microarray : A molecular cloning manual. Cold Spring Harbour Laboratory, New York.
(3) Hastie T. Tibshirani R. and Friedman J. (2001), Elements of statistical learning : Data mining, inference and prediction, Springer, New York.
(4) Johnson R.A. and Wichern D.W. (1998), Applied Multivariate statistical analysis, 4th Edition, Prentice Hall, New Jersey.
(5) Lentner M. and Bishop T. (1993), Experimental design and analysis, 2nd Ed., Valley Book Company, Verginia.
(6) Li W.H., (1997), Mocecular Evolution, Sinaur and Associates, New York.
(7) Smyth G.K., Throne N.P. and Wettenhall J. (2003) Limma : Linear Models of Microarray data user's guide. Walter and Eliza Hall Institute of Medical Research, Australia.
(8) Snedecor G. and Cocharan W. (1989), Statistical Methods. 8th Ed. Lowa State University Press lowa.
(9) Weller J.I. (2001), Quantitative trait loci analysis in animals, CABI Publishing, London.
(10) Myers E.W. (1997), Computational Methods in genomic research Plenum Press, New York.
(11) NCBI : National Centre for Biotechnology Information (1993), Manual for NCBI software development tool kit version, 1.8. National Library of medicine, National Institute of Health, Washington.
(12) Branden C. and Tooze J. (1991), Introduction to Protein Structure, Garland Publication, New York.
(13) Bushman F. (2002), Lateral DNA transfer : Mechanism and consequences. Cold Spring Harbur Laboratory Press, Cold Spring Harbur Laboratory, New York.
(14) Durbin R., Eddy S., Krogh A., and Mitchison G. (1998) Biological sequence analysis : Probalistic models of proteins and nucleic acid, Cambridge University Press, U.K.
(15) Li. W. and Graur D. (1991) Fundamentals of Molecular Evolution, Sinaur Asssociates, Sunderland, Massachusetts.
(16) Dayhoff M.O. (1978), Atlas of Protein sequence and structure, Volume 5, National Biomedical Foundation, Gergetown University, Washington.
(17) Waterman M.S. (1989), Sequence Alignment. In mathematical methods for DNA sequences. CRC Press, Boca Raton, Florida.

(18) Von Heijne G. (1987), Sequence Analysis in molecular Biology – Treasure trove or trivial pursuit, Academic Press. San Diego.

Distribution of Practical Marks :-

(1)	To perform two major experiments :	16 Marks
(2)	Viva-voce	06 Marks
(3)	Practical Record	05 Marks
(4)	Co-curricular Activity Report	03 Marks
	Total	30 Marks

List of Equipments :-

Quantity

1)	Computer Terminals :- Pentium-IV with latest configuration 8 computers for batch of 16 students	
2)	Printer CDMP : Configuration :- 24 pim, 132/80 columns	02 Nos.
3)	C++ Software (Compiler or Interpreter)	01
4)	Perl Language Compiler	01
5)	Broad Band Internet Connection	01

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