B.Sc. Final Exam., 2011

Prospectus No.2011123

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)

2010
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(Price-Rs. 13/-)
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 Improvement of Division (Higher Class) and getting Distinction in the subject and condonation of deficiency 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 broadly 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


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.


References:
5. S.Lang, Undergraduate Analysis, Springer-Verlag, New York, 1983.
7. Shanti Narayan, A Course of Mathematical Analysis, S.Chand & Co. New Delhi.

PAPER-VIII
ABSTRACTALGEBRA


References :


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PAPER-IX

**MATHEMATICAL MODELLING**


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

References :

SPECIAL THEORY OF RELATIVITY


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.


References:

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 circuits, simplification of circuits, bridge circuits, logic circuits, lattices.

Unit-II: Graph, Application of graphs, finite and infinite graphs, incidence 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 $A_i$, $B_i$ and $C_i$, 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.

References :
2) Olympia Nicodemi : “Discrete Mathematics”, C.B.S. Publ. and distributors 485, Jain Bhavan, Bholanath Nagar, Shahadara, Delhi-32 (India)
7) Goodstein : “Boolean Algebra”.

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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.

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 | 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-V : Neo tectonics: active faults, geomorphological indicators, drainage changes, recurrent seismicity.

Paper VIII
Structural Geology


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.


Paper IX

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-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.


Practical:
1. Morphometric analysis from topographical maps. Introduction to geological 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 student 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:**

**Environmental Geology:**

**Mineral Exploration:**

**Remote Sensing:**

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

Petrology Practicals :-
1. A set of 200, Rocks specimens for megascopic 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 sheme 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 Mattalic deposit of Theory course).

A Part from this geological material following equipments are essential for Megascopic and Microscopic study.
1. Petrological Slide, Projector 1.No. (For Demonstration of this section) with screen
2. Magnifiers 10x or more 20 Nos. (Table/Hand model with large view for Magascopic Study)
3. Hand lens 10 x or 20 x 20Nos.
4. Streak Plates 20 Nos.
5. Petrological ploarizing microsocope 20 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 twinning 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.

Paleaontology
1. A set of 100 fossil as included in the practical syllabus and the phylum 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.
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 situations from simplest to complex.

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

Field Work.
1. Geological Hammer 100 gm. 10 Nos.
2. Harver Sack 20 Nos.
3. Field camera (Pantax) with zoom lens and flash guns 1 Nos.
5. Steel tapes 5 Mtr., 10 & 50 Metrs. 2 Nos. Each.
6. Clinometer campas 12 Nos.
7. Brunten campas 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. Epidoscope 1 Nos.
3. Any geophysical instrument Resistivity/Seismic 1 Nos.
4. Water analysis kit 1 Nos.
5. Computer with recent configuration 1 Nos. (Minimum P-IV)

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

2) As far as possible Geological Museum 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 trigonometric, 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-IV: Linear Programming : Elementary theory of convex sets, definition of general LPP, formulation of LPP, examples of LPP, problems occurring 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 :

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. 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.

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 (up to three factors).
References:

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) Problems 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^k - Factorial Experiment arranged in R.B.D.
31) Analysis of 2^k - 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:
2. Power Resources: Coal, Petroleum and hydroelectricity: capacity of power resources and the exploitation of new possibilities.

Unit-III:
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.
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.

Unit-III:
1. Agriculture

Unit-IV:
1. Mineral and power resources.

Unit-V:
1. 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.
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.

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:

HUMAN GEOGRAPHY

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.
f) Cycles of elements in nature:
   i) Carbon cycle: CO₂ 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 IV
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) Municipal sewage treatment plant.
   c) Preliminary treatment (seiving and Grit chamber)
   d) Primary treatment (sedimentation)

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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 continuous 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) Methylen blue reduction Test. c) Phosphatase test d) Test for coliform bacteria. e) Estimation of fat in milk.
   B) Demonstration of microbes in Curd.

   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) Enumeration 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 .... 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 : Stainer & Shewan
9. Introduction to Waste Water Treatment processes : Ramalhr R.S.
10. Introduction to Soil Microbiology : Alexander Martin
11. Soil Microbiology : Subbaroa N.S.
12. Introduction to environmental Microbiology : Mitchell, Ralph
13. Sewage & Waste treatment : Hammer
14. Water Pollution : Zajic J.E.
15. Water Pollution Microbiology : Mitchell R.
16. Air Pollution : Perlins H.L.
17. Aquatic Microbiology : Stainer & Shewan
18. Introduction to Waste Water Treatment processes : Ramalhr R.S.

**BOOKS RECOMMENDED FOR PAPER-VI**

1. Food Microbiology : Frazier 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
7. Industrial Microbiology : Casida L.E.
8. Principles of Fermentation Technology Allan.
9. Outlines of Diary Bacteriology : Sukumar De
10. Modern Food Microbiology : Jay, Mames M.
13. Dairy Microbiology : Foster Etal
14. Industrial Microbiology : Rose

**BOOKS RECOMMENDED FOR PRACTICALS**

3. Microbiological Methods : Collins
4. Difco Mannual.
### List of Instruments/Equipments with specification required for B.Sc. I, II and Final Microbiology Laboratory.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>Make</th>
<th>Specification</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Autoclave</td>
<td>Yarco/Wiswo or any std.</td>
<td>Pressure gauge 0-30 psi, Size 350*325 mm, Double walled Non-Electrical</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td>a. Portable</td>
<td>make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Vertical</td>
<td>Wiswo/Yarco</td>
<td>Electrically operated or any std. make coil 2000 watts, Double walled steel</td>
<td>1.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>body.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Hot-air oven</td>
<td>Yarco/tempo/Hosp. or any</td>
<td>Double walled, Thermostat, Temp regulator, Size 45<em>45</em>45 cm, Double walled Insulated temp. Temp regulator size temp. upto 60c with termostat sensitivity +0.5 c</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Incubator</td>
<td>Yarco/Tempo/ Lab.Hosp. or</td>
<td>Thermostat, Temp regulator, Size 45<em>45</em>45 cm, Double walled, Insulated temp. Temp regulator size temp. upto 60c with termostat sensitivity +0.5 c</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>any std. make</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>std. or make</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Serological water bath</td>
<td>Yarco/Tempo/lab Hosp or and std.</td>
<td>Thermostat, Temp regulator, Size 45<em>45</em>45 cm, Double walled, Insulated temp. Temp regulator size temp. upto 60c with termostat sensitivity +0.5 c</td>
<td>1.</td>
</tr>
<tr>
<td>7.</td>
<td>Magnetic stirrer with hot plate</td>
<td>Yarco/Tempo/lab Hosp or and std. make</td>
<td>Thermostat, Temp regulator, Size 45<em>45</em>45 cm, Double walled, Insulated temp. Temp regulator size temp. upto 60c with termostat sensitivity +0.5 c</td>
<td>1.</td>
</tr>
<tr>
<td>8.</td>
<td>Cyclo-Mixer</td>
<td>Remi/tempo/or any std.</td>
<td>For one test tube only 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 Digital with glass electrode pH scale from 0 to 14, Resistant to temp. change, Digital-signal cell with either glass or quartz cuvetters visible range with coloured filters.</td>
<td>1.</td>
</tr>
<tr>
<td>9.</td>
<td>Centrifuge</td>
<td>Remi/R-8c/yarco or any std. make</td>
<td>For one test tube only 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 Digital with glass electrode pH scale from 0 to 14, Resistant to temp. change, Digital-signal cell with either glass or quartz cuvetters visible range with coloured filters.</td>
<td>1.</td>
</tr>
<tr>
<td>10.</td>
<td>pH Meter</td>
<td>Systronics/Elico J.Mitra/or any std. make</td>
<td>Digital with glass electrode pH scale from 0 to 14, Resistant to temp. change, Digital-signal cell with either glass or quartz cuvetters visible range with coloured filters.</td>
<td>1.</td>
</tr>
<tr>
<td>11.</td>
<td>Colorimeter</td>
<td>Erma/Elcol systronics or anv.std.make</td>
<td>Digital with glass electrode pH scale from 0 to 14, Resistant to temp. change, Digital-signal cell with either glass or quartz cuvetters visible range with coloured filters.</td>
<td>1.</td>
</tr>
<tr>
<td>12.</td>
<td>Distillation Assembly</td>
<td>Remi/Tempo/lab Hosp or any std. make</td>
<td>2 litres/hr.capacity with metal condensor.</td>
<td>1.</td>
</tr>
<tr>
<td>13.</td>
<td>Single pan Electrical balance</td>
<td>Systronics/K.Roy contac or any std.make</td>
<td>Digital 125 gram capacity sensitivity 0.01 gm</td>
<td>1.</td>
</tr>
<tr>
<td>14.</td>
<td>Mixer</td>
<td>Sumit/Hyotl/or any.std.make</td>
<td>with 3 Jars and Timer</td>
<td>1.</td>
</tr>
<tr>
<td>15.</td>
<td>Single pan balance (tripple beam)</td>
<td>National/Remi/or any std. make</td>
<td>III gram capacity</td>
<td>2.</td>
</tr>
<tr>
<td>16.</td>
<td>Anaerobic Jar</td>
<td>Dynamicro/or any std. make</td>
<td>Capacity 10 Petri dishes complete set.</td>
<td>1.</td>
</tr>
<tr>
<td>17.</td>
<td>Rotarv shaker.</td>
<td>Yarco/tempo/or any std. make</td>
<td>Flask capacity 36 flask Remi or 250 ml Mechanical Variable speed motion size 24*24 platform</td>
<td>1.</td>
</tr>
<tr>
<td>18.</td>
<td>Automatic Pipette washer</td>
<td>Kumar/Modem or any.std.make</td>
<td>stainless steel 1 ml.5ml. 10ml capacities.</td>
<td>1.</td>
</tr>
<tr>
<td>19.</td>
<td>Over head Projector</td>
<td>Metzer/photophone or any.std.make</td>
<td>complete with screen 72<em>50</em> Glass screen 16*16</td>
<td>1.</td>
</tr>
<tr>
<td>20.</td>
<td>Membrane Filter Assembly</td>
<td>Yarco/Tempo/or any.std.make</td>
<td>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.</td>
<td>1.</td>
</tr>
<tr>
<td>21.</td>
<td>Microscope a. Monocular</td>
<td>Olympus/Mezer/ Labo.or any. std.make</td>
<td>Straight with Mechanical stage.mirror.bojectives 10x45x,&amp;100x, Eve piece 5x,10x &amp; 15x</td>
<td>20.</td>
</tr>
<tr>
<td>22.</td>
<td>Binocular</td>
<td>Olympus/mezer/ Labo.or any.</td>
<td>Inclined with Mechanical stage.5. Mirror lighting arrangement std.make objectivesb 10x, 45x,100x, Eve piece 5x,10x, and 15x.</td>
<td>20.</td>
</tr>
<tr>
<td>23.</td>
<td>Oil Immersion lens</td>
<td>Olympus/Meopta Labo/or any.std.make(preferably Imported)</td>
<td>Original(imported)with good spring load.</td>
<td>20.</td>
</tr>
</tbody>
</table>
24. Autolet
   Ames or any std. make with lancet holder
   lancet cover end cap.

25. Laminar Air-flow (Hozt) to be installed in Asceptic room
   Micro fil/ 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"

26. Ultra-violet light (to be Fitted in Asceptic room)
   Amtres/Videocon or std.make 15 Watts/30 Watts of variable length

27. Air-Conditioner (to be installed in Asceptic Room)
   Amrrix-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
   Standard compressors.

28. Asceptic room air-conditioner
   10'10' Totally Enclosed with
   Dimension 10'10' with Air
   Conditioner and U.V.Light

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/ stainless steel.
   500w. Imported Halogen
   illumination both for
   Diascopic projection
   with powerful and Noiseless
   cooling system.A stigmatic lenses
   and Reflecting mirrors.

30. Teaching aids Epidiscope
   Metzer/ Photophone or any std. make

31. Slide projector
   Metzer/300w. Photophone

34. SANT GADGE BABA AMRAVATI UNIVERSITY PROSPECTUS

   Video cassettes Indian/Imported
   projection lenses 8 German
   lenses 85 mm f.
   2.8, coated lens.

   Video Indian/Imported
   Applied Microbiology 1.
   (Environment food)
   Industrial and medical
   Microbiology)

33. V.C.R. & T.V.set
   National/Sony Philips/Videocon or any std make
   Recording & playing facility
   T.V. 21" with remote control each

34. Computer with printer and
   Intel pentium or any standard
   Current configuration
   make.

35. Lactometer
   Std-Make
   Glass/S.S.

36. Water purifier with U.V. Light/
   Eureka Forbes Filter, Activated
   or any Carbon, U.V.Light
   Fully Automatic

37. Micropipette
   Std.Make
   0.50/-1000 / 1
   Variable range. each

38. Paper
   Std.make
   Glass with lid

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. Watson 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


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


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:

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.

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-Cholesterol, 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

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1.</td>
<td>Long Experiment. One experiment for either section A/D/E</td>
<td>10</td>
</tr>
<tr>
<td>Q.2.</td>
<td>Short Experiment - I One experiment from Section B</td>
<td>04</td>
</tr>
<tr>
<td>Q.3.</td>
<td>Short Experiment - II One experiment from Section C</td>
<td>04</td>
</tr>
<tr>
<td>Q.4.</td>
<td>Record, Classwork &amp; internal assessment</td>
<td>04</td>
</tr>
<tr>
<td>Q.5.</td>
<td>Viva</td>
<td>05</td>
</tr>
<tr>
<td>Q.6.</td>
<td>*Co-Curricular Activity Report</td>
<td>03</td>
</tr>
</tbody>
</table>

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:
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 Ouellette (Technomic Publications)
9) Water Pollution – V.P.Kudesia (Pragati Prakashan)
10) Physicochemical Examination of water, sewage & Industrial waste – N.Man WAsakam (Pragati Prakashan)
11) An Introduction to Plant Tissue and Cell Culture Emkay Publication.
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
18) Fundamentals of Air Pollution by AC Stem.

*****

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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>Make</th>
<th>Specification</th>
<th>Quantity Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Photoelectric</td>
<td>Erma Japan</td>
<td>Single cell with either glass or quartz cuvettes</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Colorimeter</td>
<td>J.Mitra</td>
<td>visible range with either glass or quartz cuvettes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elico, Specol</td>
<td>Systronic, Aimal Instrumentation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>or any one filters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>pH. Meter</td>
<td>Elico, Systronic</td>
<td>with glass electrode pH Scale from 0 to 14</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J.Mitra</td>
<td>Resistant to temp. change.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Table centrifuge</td>
<td>&quot;Remi&quot; Model R-8C*</td>
<td>&quot;Remi&quot; Model R-8C* Swing out rotor heads. One to</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tempo.</td>
<td>hold 8-16 tuber</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Incubator</td>
<td>Tempo. Lab.Hosp.</td>
<td>Double walled insulated with double Foors.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yarco.</td>
<td>(Inner glass door)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Temp. upto 600C</td>
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<td></td>
<td></td>
<td></td>
<td>with thermostat.</td>
<td></td>
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<td></td>
<td>Sensitivity +0.50 C</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Hot-air</td>
<td>Yarco</td>
<td>Double walled</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ovan</td>
<td>Thermostal temperature regulator. Size:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>455x605x455 mm.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Refrigerator</td>
<td>&quot;Votlas&quot; &quot;Goderj&quot;</td>
<td>Double door with 300 Lit. capacity.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Allwyn</td>
<td>having separate freezer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kelvinator</td>
<td>or any make.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Serological water</td>
<td>&quot;Tempo&quot;</td>
<td>Double walled</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Bath</td>
<td>&quot;Lab. Hosp&quot;</td>
<td>Thermoregulated.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yarco or any make.</td>
<td>Mix. temp. upto 800 C</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Size: 12x15x12 with cover.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Magnetic Stirrer</td>
<td>&quot;Tempo&quot;</td>
<td>2 Lit. Capacity</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>with Hot</td>
<td>&quot;Remi&quot; Lab Hosp.</td>
<td>with 500 Wt. temp. regulated or any hot plate.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Metal Water Disti-</td>
<td>&quot;Remi&quot;</td>
<td>2 Lits/Hr capacity with metal condensor.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>lution plant</td>
<td>&quot;Tempo&quot; Lab Hosp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Thin Layer</td>
<td>---</td>
<td>Chamber of Glass Tank</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Chromatography</td>
<td>---</td>
<td>Spreader Glass</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assembly</td>
<td>---</td>
<td>Plates Stage for glass Plates.</td>
<td></td>
</tr>
</tbody>
</table>
11. Hot Plate
   "Tempo"
   "Remi"
   "Lab. Hosp.*
or any make.
   Round 7 Diameter
   with 3 way control
   switch.
   1000 watts.

12. Mixer
   "Remi"
   "Sumit"
   any make.
   with 3 jars and
   timer.

13. Single Pan
    Balance
    (Tripple
    beam)
   National
   Scientific
   Work
   VARANASI
   100gm.
   capacity

14. One Pan
    Electric
    Balance
   U'mex
   Instruments
   works.
   VARANASI
   100 gm.
   Capacity.
   Accury upto
   4th decimal of gm.

15. Cyclo-Mixer
    "Vortex"
    "Remi"
    For one test
    tube only

16. Laboratory
    Microscope
   "Olympus"
   or any make.
   Monocular
   Medicinal micro-
   Sliding stage.

17. Fingure
    pricking
    needle.
   "Auto Let"
   Japan
   with Disposable
   Needler.

18. Haemometer
    Sahl's
   GDR
   make or Top.
   with Comparator
   Glass, Tube and
   Hb pipett

19. Neubauer's
    Counting
    Chamber.
   ---
   with Bright
   rulings.

20. RBC Pipettes
    GDR or
    England mak
    or any make.
    ---
    25
    Nags.

21. WBC Pipettes
    ---
    25
    Nags.

22. lab. Cell
    Counter
    any make
    ---
    25
    Nags.

23. Test Tubes
    Borosil/Cor-
    ning/Vensil
    20ml capacity
    1000 Nos.

24. Centrifuge
    Borosil/Cor-
    ning/Vensil
    15ml capacity
    100 Nos.

25. Folin-Wu
    Tubes
    Corning/Cor-
    ning/Vensil
    25ml capacity
    50 Nos.
    with bulb.

26. Nesseler's
    Tubes
    Corning/Cor-
    ning/Vensil
    25 ml capacity
    50 Nos.
    with 12.5 ml
    mark.

27. Boiling Tubes
    (Hard glass)
   Corning/Cor-
    ning/Vensil
   50ml capacity
   60 Nos.

28. K.T. Tubes
    Borosil/Cor-
    ning/Vensil
   5 ml capacity
   20 Nos.

29. Burettes
    Emkay or
    any make.
    50 ml capacity
    20 Nos.
    with stop cock

30. Microburettes
    Borosil/Emkay
   10 ml
   10 Nos.

31. Pipettes
    Borosil/Cor-
    ning/Vensil
   10 ml capacity
   with graduation
   5 ml capacity
   with graduation
   0.2 ml capacity
   with graduation
   0.1 ml capacity
   with graduation
   20 Nos.
   (graduated)
   20 Nos.
   (graduated)
   20 Nos.
   (graduated)
   20 Nos.
   zero at tip.
   20 Nos.
   (graduated)
   20 Nos.
   (graduated)
   20 Nos.
   20 Nos.

32. Measuring
    Cylinders
   Corning/Cor-
    ning/Vensil
   1000 ml
   1 No.
   graduated
   500 ml graduated
   1 No.
   100 ml graduated
   5 Nos.
   50 ml capacity
   with graduation
   5 Nos.
   10 ml capacity
   graduation
   3 Nos.

33. Standard
    Volumetric
    Borosil/Vensil
   1 Lit. capacity
   3 Nos.

34. Glass-ware:-
   1. Test Tubes
      Borosil/Cor-
      ning/Vensil
      20ml capacity
      1000 Nos.
   2. Centrifuge
      Borosil/Cor-
      ning/Vensil
      15ml capacity
      100 Nos.
   3. Folin-Wu
      Tubes
      Corning/Cor-
      ning/Vensil
      25ml capacity
      50 Nos.
      with bulb.
   4. Nesseler's
      Tubes
      Corning/Cor-
      ning/Vensil
      25 ml capacity
      50 Nos.
      with 12.5 ml
      mark.
   5. Boiling Tubes
      (Hard glass)
     Corning/Cor-
      ning/Vensil
     50ml capacity
     60 Nos.
   6. K.T. Tubes
      Borosil/Cor-
      ning/Vensil
     5 ml capacity
     20 Nos.
   7. Burettes
      Emkay or
      any make.
    50 ml capacity
    20 Nos.
    with stop cock
   8. Microburettes
      Borosil/Emkay
      10 ml
     10 Nos.
   9. Pipettes
      Borosil/Cor-
      ning/Vensil
     10 ml capacity
     with graduation
     5 ml capacity
     with graduation
     0.2 ml capacity
     with graduation
     0.1 ml capacity
     with graduation
     20 Nos.
     (graduated)
     20 Nos.
     (graduated)
     20 Nos.
     (graduated)
     20 Nos.
     zero at tip.
     20 Nos.
     (graduated)
     20 Nos.
     (graduated)
     20 Nos.
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     20 Nos.
     20 Nos.
Chapter 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, DML operations on views.

Unit-II: Relational Model: Relations, domains & attributes, keys, E-R diagrams, reducing E-R diagrams to tables, functional dependency, 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 Previlages: 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 & Bhattacharyya - 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 editor, 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, triggering 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, producing 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-related commands.

Books Recommended:
1) Visual Basic 6.0 in 21 days - Greg Perry - Techmedia
2) Visual Basic 6.0 The Complete 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 aspects 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.


I) Hardware:-
   a) Computer Terminals: 10 Nos.
      Desirable configuration: Computer with latest configuration.
   b) Printer (DMP): 2 Nos.
   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.
Unit II  
Drinking Water Treatment - Aeration, sedimentation, coagulation, rapid sand filter. Methods of disinfection - Chlorination, Ozonation, UV-rays.

Unit III  
(A) Solid Waste : Definition, types, composition, sources. Solid Waste Treatment methods & Disposals.
(B) Waste Water Treatment in - Pulp & Paper, Sugar industries.

Unit IV  
(A) Water Quality Standards.
(B) Sampling and Analysis of Water.

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-quartile of variation, correlation and regression.

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  

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 - Definition, concept, scope and objectives, Methodologies of EIA.

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

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) Microbial Analysis of Water.
j) Estimation of Oil & Grease
k) Estimation of TS, TDS, TSS, TVS.
m) Estimation of Sulphates by Gravimetry and Spectrophotometer
n) Estimation of H2S from given water sample.
o) Estimation of Trace Elements by paper chromatography
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 settleable particulates by dust fall jar.
c) Qualitative Determination of SO2, CO2, 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 CO2 concentration in air by Zincondroff method.
g) Separation of gas components (O2, N2, CO & CO2) by Orsat apparatus.

3) Measurement of Noise Level.
4) Study of Satellite Imagery or Arial Photographs.

**DISTRIBUTION OF MARKS OF PRACTICAL EXAMINATION**

<table>
<thead>
<tr>
<th>Maximum Marks</th>
<th>Duration : 8 Hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1 Any one Experiment on Water Analysis</td>
<td>8 Marks</td>
</tr>
<tr>
<td>Q.2 Any one Experiment on Air Pollution or Noise Pollution</td>
<td>8 Marks</td>
</tr>
<tr>
<td>Q.3 Project Work Report Submission</td>
<td>6 Marks</td>
</tr>
<tr>
<td>Q.4 Class Record + Viva-Voce</td>
<td>5 Marks</td>
</tr>
<tr>
<td>Q.5 *Co-Curricular Activity Report</td>
<td>3 Marks</td>
</tr>
</tbody>
</table>

**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 Photometer
9. Sound Level Meter
10. High Volute Sampler
11. Water Sampler
12. Lopered 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 Anjaneyulu.
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.
8. Fundamentals of Environmental Pollution by K.Kanna.
11. Environmental Pollution: Monitor and Control by S.M.Khopkar.
12. Air Pollution - by V.P.Kudesia.
15. Air Pollution and Control by Muralikrishna.
16. Environmental Management by G.N.Pande
18. Pollution Management in Industries by R.K.Trivedi.
19. Encyclopedia of Environmental Pollution Control by R.K.Trivedi.
21. Chemical and Biological Methods for Water Pollution Studies by Trivedi G

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 year digits method.

Unit II  Profitability

Introduction, 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, sulphur 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)

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 experiemntal 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 environmental samples.

**Unit V  Organo Analytical Chemistry**


N-acetyl, hydroxyethyl (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 Chromatography :**

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

**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$^{2+}$

**Solvent Extraction :**

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

**List of Books**

2. Instrumental Methods of Chemical Analysis - Willard, merit & Dean.
7. Methods of Chemical Analysis Khopkar.
8. Analytical Chemistry - I.G.Dick

* * *
II. 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, Dehydrogenation 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 by various routes like Good year scientific Design processes, Dehydrogenation of tertamylenes (Shell processes), Acetone-acetylene route, Isobutylene- formaldehyde route, dehydrogenation of C5-stream.

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

Unit III : C8 Aromatics, occurrence, 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.
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.

Transterfication with diols, polymersation of glycol terephthalate, Polyester - saturated polyester, PET, unsaturated polyester. 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 anhydride Introduction to synthetic detergents. Chemistry of Sulfonation of LAB, AB and alfa olefines.

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

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

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


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


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,


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

(Not : 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, polystrene etc.
3. For above laboratory prepare chemicals and polymers check the Physical; and chemical properties like melting point, boiling point, viscosity, viscosity index, moisture content, impurities present, ash content, residue, inorganic material presents etc.
4. Collect the various petroleum sample like gasoline, kerosene, diesel, oils etc and cheek 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. bottling/filling plant, chemical plant and note the unit operations and unit processes they are using.

BOOKS RECOMMENDED:

GENERAL TEXTBOOKS

8. Petrotechmicals, Dr.B.K.Roy.

BOOKS DEALING WITH SPECIFIC AREAS:

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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name</th>
<th>Minimum Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Burette</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Pipette (10 ml, 25 ml)</td>
<td>20 Nos. each</td>
</tr>
<tr>
<td>3</td>
<td>Mohr Pipette (2 ml, 5 ml)</td>
<td>10 Nos. each</td>
</tr>
<tr>
<td>4</td>
<td>Conical Flasks with stoppers</td>
<td>50 Nos.</td>
</tr>
<tr>
<td>5</td>
<td>Standard volumetric flasks</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>6</td>
<td>Density bottle</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>Balance (Electronics / Digital)</td>
<td>02 Nos.</td>
</tr>
<tr>
<td>8</td>
<td>Aniline point apparatus</td>
<td>01 No.</td>
</tr>
<tr>
<td>9</td>
<td>U-tube viscometers of different capillary size</td>
<td>02 sets</td>
</tr>
<tr>
<td>10</td>
<td>Thermometer (0 to 110 0c IP Grade)</td>
<td>10 No.</td>
</tr>
<tr>
<td>11</td>
<td>Thermometer (0 to 360 0c IP Grade)</td>
<td>06 Nos.</td>
</tr>
<tr>
<td>12</td>
<td>Test tube (20 ml and 50 ml with rubber cork)</td>
<td>50 Nos.</td>
</tr>
<tr>
<td>13</td>
<td>Smoke point apparatus (IP Grade)</td>
<td>01 No.</td>
</tr>
<tr>
<td>14</td>
<td>Abel Flash point Apparatus (IP Grade)</td>
<td>01 No.</td>
</tr>
<tr>
<td>15</td>
<td>Pensky Martens Flash point Apparatus</td>
<td>01 No.</td>
</tr>
<tr>
<td>16</td>
<td>Cleveland Open cup Flash point Apparatus</td>
<td>01 No.</td>
</tr>
<tr>
<td>17</td>
<td>Porcelainine Disc</td>
<td>10 Nos.</td>
</tr>
<tr>
<td>18</td>
<td>Constant Temperature Bath</td>
<td>02 Nos.</td>
</tr>
<tr>
<td>19</td>
<td>Hot plate</td>
<td>01 No.</td>
</tr>
<tr>
<td>20</td>
<td>Air condensor</td>
<td>20 No.</td>
</tr>
<tr>
<td>21</td>
<td>Glass tubing (6mm, 10mm)</td>
<td>20 Ft. Each</td>
</tr>
<tr>
<td>22</td>
<td>Glass rod (4mm, 8mm)</td>
<td>20 Ft. Each</td>
</tr>
<tr>
<td>23</td>
<td>Stop Watches</td>
<td>04 No.</td>
</tr>
<tr>
<td>24</td>
<td>LPG Cylinder with regulator</td>
<td>01 No.</td>
</tr>
<tr>
<td>25</td>
<td>Refractometer</td>
<td>01 No.</td>
</tr>
<tr>
<td>26</td>
<td>Refrigerator</td>
<td>01 No.</td>
</tr>
<tr>
<td>27</td>
<td>Water Distillation Plant</td>
<td>01 No.</td>
</tr>
<tr>
<td>28</td>
<td>Beaker 250 ml</td>
<td>20 No.</td>
</tr>
<tr>
<td>29</td>
<td>Beaker 50 ml, 100 ml, 500 ml, 1000 ml</td>
<td>7 Nos. each</td>
</tr>
<tr>
<td>30</td>
<td>Hot air oven</td>
<td>1 No.</td>
</tr>
<tr>
<td>31</td>
<td>Heating Furnace</td>
<td>1 No.</td>
</tr>
</tbody>
</table>
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, I-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 explanation 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 :**
2. Relativistic Mechanics - Satya Prakash (Pragati Prakashan, Meerut)
5. Prospective of Modern Physics - A Beiser
7. Concept of Modern Physics - S.L.Gupta, S.Gupta
8. Introduction to Atomic Physics - H.E.White
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

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**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 Kand’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

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 \( \pi \) 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 \( \alpha \), \( \beta \) 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.

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
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
13. Linear Integrated Circuits - Rao and Sutrawe (Nirali Prakashan, Pune)

B.Sc.-III (Physics Practical)

Every student will have to perform at least 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 $\gamma$-rays/ $\alpha$-rays.
15. To study hysteresis curve of transformer core.
17. To find band gap energy of semiconductor.
18. To determine characteristics of CE-transistor.
19. To determine characteristics of CB-transistor.
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 / transistor 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-transistor.
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.

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

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of apparatus/Unit</th>
<th>Minimum requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Optical bench</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Research optical bench</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Convex lenses</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>Bipirism</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Prism</td>
<td>6</td>
</tr>
<tr>
<td>6.</td>
<td>Double image prism</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>Sodium Lamps Complete</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>Newton's ring apparatus</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>diffraction grating</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>Spectrometer</td>
<td>4</td>
</tr>
<tr>
<td>11.</td>
<td>Adjustable slits</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>Microscope (Travelling) vertical</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Horizontal</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Telescope</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>Potentiometer</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>Resistance box -- 1 - 500</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 - 5000</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>1 - 10,000</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fractional</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>Two way plug keys</td>
<td>5</td>
</tr>
<tr>
<td>17.</td>
<td>Rheostats</td>
<td>6</td>
</tr>
<tr>
<td>18.</td>
<td>Galvanometers</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>Battery eliminator (Variable)</td>
<td>7</td>
</tr>
<tr>
<td>20.</td>
<td>Ammeter</td>
<td>4</td>
</tr>
<tr>
<td>21.</td>
<td>Voltmeter</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>Multimeter</td>
<td>8</td>
</tr>
<tr>
<td>23.</td>
<td>Leclanch's cell</td>
<td>3</td>
</tr>
<tr>
<td>24.</td>
<td>Plug key</td>
<td>10</td>
</tr>
<tr>
<td>25.</td>
<td>Tap key</td>
<td>6</td>
</tr>
<tr>
<td>26.</td>
<td>Carry Foster's bridge</td>
<td>3</td>
</tr>
<tr>
<td>27.</td>
<td>Thermocouple</td>
<td>1</td>
</tr>
<tr>
<td>28.</td>
<td>Hot water bath</td>
<td>2</td>
</tr>
<tr>
<td>29.</td>
<td>Ballistic galvanometer</td>
<td>2</td>
</tr>
<tr>
<td>30.</td>
<td>Transformer</td>
<td>4</td>
</tr>
<tr>
<td>31.</td>
<td>Mercury Lamps</td>
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<tr>
<td>32.</td>
<td>Standard resistance - 1</td>
<td>2</td>
</tr>
<tr>
<td>33.</td>
<td>Charge - discharge dy for absolute</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>capacity</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Inductances .</td>
<td>01 H</td>
</tr>
<tr>
<td></td>
<td>05 H</td>
<td>2</td>
</tr>
<tr>
<td>35.</td>
<td>Oscillator (A. F.)</td>
<td>5</td>
</tr>
<tr>
<td>36.</td>
<td>Oscillator (R. F.)</td>
<td>2</td>
</tr>
<tr>
<td>37.</td>
<td>Connecting wire</td>
<td>1 kg.</td>
</tr>
<tr>
<td>38.</td>
<td>V.T.V.M.</td>
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</tr>
<tr>
<td>No.</td>
<td>Item</td>
<td>Quantity</td>
</tr>
<tr>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>39</td>
<td>C.R.O.</td>
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<tr>
<td>40</td>
<td>Dimerstate</td>
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<tr>
<td>41</td>
<td>Fixed condenser</td>
<td>4</td>
</tr>
<tr>
<td>42</td>
<td>Babinet compensator</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Polarimeter</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Bar pendulum</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>Stop watches</td>
<td>6</td>
</tr>
<tr>
<td>46</td>
<td>Meter Scale</td>
<td>6</td>
</tr>
<tr>
<td>47</td>
<td>G.clamps</td>
<td>4</td>
</tr>
<tr>
<td>48</td>
<td>Knife edges</td>
<td>4</td>
</tr>
<tr>
<td>49</td>
<td>Metal bars</td>
<td>3</td>
</tr>
<tr>
<td>50</td>
<td>Vernier callipers</td>
<td>3</td>
</tr>
<tr>
<td>51</td>
<td>Maxwell's needle for 'n' apparatus</td>
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</tr>
<tr>
<td>52</td>
<td>Ring disc (Dynamics) apparatus</td>
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</tr>
<tr>
<td>53</td>
<td>Poisullie's flow apparatus complete</td>
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</tr>
<tr>
<td>54</td>
<td>Thermometers 0 - 1100</td>
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</tr>
<tr>
<td>55</td>
<td>Steam traps (glass)</td>
<td>4</td>
</tr>
<tr>
<td>56</td>
<td>Stands</td>
<td>5</td>
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<tr>
<td>57</td>
<td>Weight boxes</td>
<td>6</td>
</tr>
<tr>
<td>58</td>
<td>Helmholtz resonator</td>
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</tr>
<tr>
<td>59</td>
<td>Tunning forks set</td>
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</tr>
<tr>
<td>60</td>
<td>Frequency of A.C. mains apparatus</td>
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</tr>
<tr>
<td>61</td>
<td>Measuring cylinders 200 ml.</td>
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</tr>
<tr>
<td>62</td>
<td>Thomon's tube for e/m</td>
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</tr>
<tr>
<td>63</td>
<td>Milikan's apparatus</td>
<td>1</td>
</tr>
<tr>
<td>64</td>
<td>X- ray diffraction pattern b c c powder</td>
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</tr>
<tr>
<td>65</td>
<td>Study board of power supply</td>
<td>1</td>
</tr>
<tr>
<td>66</td>
<td>Study board of wein's bridge oscillator</td>
<td>1</td>
</tr>
<tr>
<td>67</td>
<td>G.M. counter experiment set</td>
<td>1</td>
</tr>
<tr>
<td>68</td>
<td>Study board of half adder/ full adder</td>
<td>1</td>
</tr>
<tr>
<td>69</td>
<td>Study board of logic gates</td>
<td>1</td>
</tr>
<tr>
<td>70</td>
<td>Study board of &quot;Characteristics of Phototransistor&quot;</td>
<td>1</td>
</tr>
<tr>
<td>71</td>
<td>Study board of NOR gates and switching characteristics</td>
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</tr>
<tr>
<td>72</td>
<td>Study board of NAND gate and switching characteristics</td>
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</tr>
<tr>
<td>73</td>
<td>Study board of Sequential logic FF</td>
<td>1</td>
</tr>
<tr>
<td>74</td>
<td>Study board of Sequential logic RS FF</td>
<td>1</td>
</tr>
<tr>
<td>75</td>
<td>Study board of Sequential logic C RSFF</td>
<td>1</td>
</tr>
<tr>
<td>76</td>
<td>Study board of Sequential logic J K FF</td>
<td>1</td>
</tr>
<tr>
<td>77</td>
<td>Study board of Op-Amp as differentiator</td>
<td>1</td>
</tr>
<tr>
<td>78</td>
<td>Study board of Op-Amp as an integrator</td>
<td>1</td>
</tr>
<tr>
<td>79</td>
<td>Study board of Op-Amp as an inverting amplifiers</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>Study board Op-Amp as a Non-inverting amplifiers.</td>
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</tr>
<tr>
<td>81</td>
<td>Study of monostable multivibrator</td>
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</tr>
<tr>
<td>82</td>
<td>Study of bistal multivibrator</td>
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</tr>
<tr>
<td>83</td>
<td>Study of Astable multivibrator</td>
<td>1</td>
</tr>
<tr>
<td>84</td>
<td>Study of MOPA</td>
<td>1</td>
</tr>
<tr>
<td>85</td>
<td>Study of VHF oscillator</td>
<td>1</td>
</tr>
<tr>
<td>86</td>
<td>Study of diode detector</td>
<td>1</td>
</tr>
<tr>
<td>87</td>
<td>Study of amplitude modulator</td>
<td>1</td>
</tr>
<tr>
<td>88</td>
<td>Study of TRF receiver</td>
<td>1</td>
</tr>
<tr>
<td>89</td>
<td>Study of super herrodyne receiver</td>
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</tr>
<tr>
<td>90</td>
<td>Digital power supply (Dual type) +15 to-15</td>
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</tr>
<tr>
<td>91</td>
<td>P-N-diode</td>
<td>2</td>
</tr>
<tr>
<td>92</td>
<td>Apparatus of I-H curve</td>
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<td>93</td>
<td>Study board for diode as rectifier</td>
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<td>94</td>
<td>Study board for Thevinin's theorem</td>
<td>1</td>
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<td>95</td>
<td>Study board for Millman's theorem</td>
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<td>96</td>
<td>Study of Activation energy of thermister</td>
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<td>97</td>
<td>Study board owen's bridge</td>
<td>1</td>
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<td>98</td>
<td>Study board for maximum power transfer theorem</td>
<td>1</td>
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<td>99</td>
<td>'Y' by bending apparatus</td>
<td>1</td>
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<td>100</td>
<td>Thermal conductivity of rubber tube Caryparatus</td>
<td>1</td>
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<td>101</td>
<td>'n' by statistical method apparatus</td>
<td>1</td>
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<td>102</td>
<td>Keler's Pendulum</td>
<td>1</td>
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<tr>
<td>103</td>
<td>Zener Diode expt.set</td>
<td>1</td>
</tr>
<tr>
<td>104</td>
<td>Set for study of Star Delta Transformation</td>
<td>1</td>
</tr>
</tbody>
</table>
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

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)

UNIT I COORDINATION COMPOUNDS - I [12]

UNIT II COORDINATION COMPOUNDS - II [6]
A] Crystal Field Theory :
Elementary idea about CFT, Crystal field splitting 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 $e_g$ orbitals in octahedral field, concept of CFSE, high spin and low spin complexes on the basis of $\Delta_0$ 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 \([\text{Ti(H}_2\text{O)}_6]\)\(^{3+}\) complex ion. Spectrochemical series.

UNIT III  COORDINATION COMPOUNDS - III

A] Chelates : [2]
Definition, classification and applications of chelates in analytical chemistry.


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

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

B] Inorganic Polymers : [6]

UNIT V

Essential and trace elements in biological processes. Biological role of alkali and alkaline earth metal ions with special reference to \(\text{Ca}^{2+}\), \(\text{Mg}^{2+}\), \(\text{Na}^{+}\) and \(\text{K}^{+}\) ions. Metalloporphyrins with special reference to haemoglobin and myoglobin. Nitrogen fixation.

B] Analytical Chemistry :
1) Spectrophotometry and Colorimetry : [4]
Concept of \(\lambda_{\text{max}}\), 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]

Paper-VIII
(=) Organic Chemistry
Total Lectures : 60
Marks : 40
B. Sc. PART-III EXAM, 2011

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, fingerprint region. Structure of organic compounds. (IR spectra of simple compounds: H₂O, CO₂, CH≡CH, CH₃COCH₃).

UNIT III 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 dephasing 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, acetaldehyde, 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 spectrometer. Exact masses of nucleotides, molecular ions, isotope ions, fragment ions. Determination of molecular formula on the basis of mass spectra.

UNIT IV SPECTROSCOPY - II

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


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]

UNIT IV ELECTROCHEMISTRY [12]

UNIT V NUCLEAR CHEMISTRY [12]

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. Na₃[Fe(C₂O₄)₃].
2] Preparation of copper-tetramine complex i.e. [Cu(NH₃)₄]SO₄.
3] Preparation of Ni²⁺-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 Prussian 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 Zn²⁺ 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 Na₃[Fe(C₂O₄)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.
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.
13] Estimation of free fatty acids in oil.
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_{2}Cr_{2}O_{7} / KMnO_{4} as titrant and calculate the redox potential of \text{Fe}^{2+} \text{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_{2}Cr_{2}O_{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).**
5) Inorganic Chemistry, A.G.Sharpe, ELBS.
11) Computer Science Common Sense, R.Hant and Shelly, Prentice Hall.
12) University General Chemistry, C.N.R.Rao, Macmillan.

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Books recommended for paper-VII (Inorganic Chemistry)
3. Selected topics in Inorganic Chemistry by Malik, Tuli and Madan S. Chand & Co.
6. Concise Inorganic Chemistry by J.D. Lee - Elbs.
12. Inorganic Complex Compound by Murmann-Chapman & Hall.

Books recommended for Paper VIII (Organic Chemistry)

7. Stereochemistry & Mechanism through Solved Problems by P.S. Kalsi.

Books recommended for paper IX (Physical Chemistry)
8. Practical Physical Chemistry : Palit and De.
12. Practical Chemistry : Dr. S.B. Lohiya


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 °C. 20 nos./batch.
6. Thermometer 0 to 110 °C. 20 nos./batch.
7. Analytical balance 15 nos./batch.
8. Weight box 15 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 02 no/lab.
   (Electrically operated)
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.

** ** **

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, C₃-plants, C₄ plants, C₅-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 euukaryotes; 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 morphogenesis; biology of *Agrobacterium*, vectors for gene delivery and marker genes; salient achievements in crop biotechnology.

**BOTANY PRACTICAL**

1) Plant Physiology (Major) (Any seven)
   - To study the effect of temperature and alcohol on permeability of plasma membrane.
   - Separation of chlorophyll pigments by solvent / paper chromatography method.
   - To compare the rate of transpiration from two surfaces of a leaf by Bell Jar method.
   - To study osmotic pressure of cell sap by plasmolytic method.

2) Minor Physiology Experiments (Any three)
   - To demonstrate fermentation.
   - To demonstrate exo and endosmosis.
   - To demonstrate that light is necessary for photosynthesis. (Ganong’s light screen)

3) Cytology
   - Squash / Smear preparation for cell divisions.
   - Fixation and staining of mitochondria and salivary gland chromosomes.

4) Biochemistry (Any four)
   - To study the enzyme activity of catalase.
   - To demonstrate test for glucose in grapes, & sucrose in canesugar / beet root.
   - To demonstrate test for protein.
   - To demonstrate the activity of enzyme papain (on egg albumin)

5) Genetics
   - To prove Mendel’s Monohybrid ratio.
   - To prove Mendel’s Dihybrid ratio.

6) Biotechnology (Any Two)
   - 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) Salisbury & 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
19) Veerbala Rastogi: Introduction to cytology.
21) De-Robertis EDP: Cell Biology.
22) Dalela & Verma: Cytology.
23) P.K.Gupta: Cytogenetics & Evolution.
26) Rastogi: Cell Biology.
39) P.K.Gupta Biotechnology.
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 separately in theory and practical examinations.

(Note :- Paper VII and VIII are compulsory 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.
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 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. (Lamarckanism, 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, palaeozoic 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, potassium orgen method.)
4.2 Phylogeny of Horse. (Orohippus, Epihippus, Mesohippus, Miohippus, Parahippus, Merychippus, Phiohippus, Equus).

Univ V
5.1 Evolution of man.
5.2 a) Neanderthalers, cromagnon 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) - Dobzemsy.
05. Population, species & Evolution - Major.
06. Animal cytology and Evolution - White.
07. Verma, P.S. and V.K.Agrawal - Genetics, S.Chand and Co.,
09. Gunther S. Stent, Moleclar Genetics, Mcmillan publishing Co.Inc.
12. Stickberger, Genetics, Machmillan publications.
15. K. B. Ahuvalia - Genetics.
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 construction 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, peniculture, 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 fingerlings.
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, mirgial, grass carp, silver carp, common carp, clarius, heteropeuusites, ophiocophalus and wallago.
02. Identification and comment on aquatic weeds, aquatic 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 following fixatives. Formalin, alcohol, acetone, Bouin’s fluid, carny’s fluid, formal sublimate.
12. Fixation of organs.
13. Preparation of Blocks, section cutting, staining and mounting.
14. Use of camera lucida.

BOOKS RECOMMENDED
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 Indifian fisheries - Shrivastava.
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.

Distribution of marks for practical examination.

<table>
<thead>
<tr>
<th>Time: 4 Hrs.</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01. Identification, classification and comment on spot. (Fish, aquatic weeds, insects or planktons) 1 to 5</td>
<td>05</td>
</tr>
<tr>
<td>02. Dissection of fish/prawn/insect life cycle</td>
<td>04</td>
</tr>
<tr>
<td>03. Microtechnique. a) Section cutting and spreading of ribbons. b) Staining of the given slide c) Camera lucida drawing of the given object.</td>
<td>04 03 03</td>
</tr>
<tr>
<td>04. Permanent slides submitted by the examinee (5 Slides)</td>
<td>02</td>
</tr>
<tr>
<td>05. Class record (duly signed by teacher incharge and certified by H.O.D.)</td>
<td>02</td>
</tr>
<tr>
<td>06. Collection of Animals.</td>
<td>02</td>
</tr>
<tr>
<td>07. Viva - voce</td>
<td>02</td>
</tr>
<tr>
<td>08. *Co-curricular Activity Report</td>
<td>03</td>
</tr>
<tr>
<td><strong>Total Marks</strong></td>
<td>30</td>
</tr>
</tbody>
</table>

*"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 IX (OPTIONAL)**

**APPLIED ZOOLOGY**

2. ECONOMIC ENTOMOLOGY

Max. Marks - 40

<table>
<thead>
<tr>
<th>Total Period - 60</th>
</tr>
</thead>
</table>

**Unit I**

1.1 General characters and classification of Insects.
1.2 Common Agricultural 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
5. Pruthi, H.S. Text Book of Agricultural Entomology.
6. David, V.B. & Kumarswami “Elements of Economic Entomology”
8. Economic Zoology - Skulkla Upadhaya Rastogi publication.
9. T.B. of Microtechnique & Environmental Science Dr. G.N.Wankhade, Dr. R.R.Dhonde & Dr. S. A. Akarte. Bajaj Publication.

List of Practical :
1. Indentification, Classification upto family and characters of following insects. Silkmoth, Honey bee, Red cotton bug, Lemon butterfly, Grass hopper, Locust, Aphids Jassids and locally available insects.
3. Collection of local Insects.
4. Visit to Sericulture, Apiculture, Local crop pest.
5. Preparation of following fixatives - Alcohol, Acetone, Formalin, Bouin’s fluid, Carnoy fluid, Formal Sublimate.
6. Preparation of Alcoholic grades.
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. 5
(fish, aquatics weeds, insects or panktons) 1 to 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 2
   (A visit to fish form)
07. Viva - voce 3
08. *Co-curricular Activity Report 3

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.

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 1
9. Photographic Papers 1
10. Printing enlarger 1
11. Compound microscope 10
12. Refrigerator 1
13. Microtome blades 5
14. Haemoglobinometer 1
15. Blood pressure apparatus 1
16. Wooden slide Cabinet 10
17. Staining Racks 1
18. Wax Bath 2
dozons
20. Staining jars with lids 2
dozens
21. Antiserum A
22. Antiserum B
23. Antiserum D
24. Haemocytometer 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)

***

**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 :

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>One Expt.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Practical Record</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Viva on expt.</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Project (experimental)</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Project Report</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td><em>Co-curricular Activity Report</em></td>
<td>-</td>
</tr>
</tbody>
</table>

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**

**ADVANCED 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 Display, 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, thermistor, 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, substraction, 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 8255, power down mode.

Modelling and 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.
13. Study of data acquisition system using computer.
15. Study of T.V. cammera.
16. Study of Video Cassette 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)
19. Study of PC based logic controller card.
20. Study of PC based ADC 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)

****

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:

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.
15. Microprocessor and Microcomputer - B.Ram.
17. Electronic Instrumentation - D.Cooper

****

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.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Apparatus</th>
<th>Minimum Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>VTVM/FET VOM</td>
<td>05</td>
</tr>
<tr>
<td>2.</td>
<td>CRO</td>
<td>05</td>
</tr>
<tr>
<td>3.</td>
<td>CRO DUAL TRACE</td>
<td>02</td>
</tr>
</tbody>
</table>
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 - 1 A 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 syllabus 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 for 78xx series.
28. Linear & digital IC tester boards each 01

List of Loose Components

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Component</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Registers - 1W SD (pieces of each)</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Capacitors - 30V 10 (pieces of each)</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Inductors 2 (pieces of each)</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Transistors a) AC 127/128 b) BC 147/148 c) SL/HL 100 d) BC 107/108 e) others if necessary 15 pieces of each</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Diodes 15 pieces of each.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>UJT/SCR/Diac/Triac 05 pieces of each.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Potentiometers a) 0 - 500 05 b) 0 - 1K 10 c) 0 - 2K 10</td>
<td></td>
</tr>
</tbody>
</table>
B.Sc.PART-III EXAM, 2011

8. Step down transformers 03 pieces each.
9. ICs 741/3085/555/565 each 05
    723/78XX/79XX
    74XX series
10. Other Missilaneous components 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 sequencing, 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, thyroxine, 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 IV : Entrepreneurship, 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.
9. Costing of Biological specimens, quotations.
10. Storage and packing of finished goods.
12. Use of computer in the maintenance of stock, quotations etc.
13. Project work.

**PRACTICAL EXAMINATION**

<table>
<thead>
<tr>
<th>Question</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.1 Polyacrylamide gel electrophoresis or Southern blotting techniques or Biochemical techniques as per theory</td>
<td>5 marks</td>
</tr>
<tr>
<td>Q.2 Processing of assorted data by using computer or Preparation of order/bill as per quotation</td>
<td>5 marks</td>
</tr>
<tr>
<td>Q.3 Identification of endangered plants and animal species (5 spots)</td>
<td>5 marks</td>
</tr>
<tr>
<td>Q.4 Project</td>
<td>10 Marks</td>
</tr>
<tr>
<td>Q.5 Practical record &amp; Viva voce</td>
<td>5 marks</td>
</tr>
</tbody>
</table>

**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.
11. pH values and their determination : BDH Laboratory chemicals division.
17. Low cost chemical instrumentation : Sane K.V., University of 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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>University practical examination (Two experiments)</td>
<td>18 marks</td>
</tr>
<tr>
<td>Sessional work</td>
<td>6 marks</td>
</tr>
<tr>
<td>Viva-voce (Three for each expt)</td>
<td>06 marks</td>
</tr>
</tbody>
</table>

**Total : 30 Marks**
Paper-VII

Signal generation and conditioning


Unit II : Signal generation and processing: Sine wave generation, Triangle and Square wave 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


Reference Books:
1. Instrumentation Devices & Systems - Rangan Sharma
2. Electrical & Electronics Instrumentation - A.K.Sawhney
3. Electronic Instrumentation - D.Cooker

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 logic 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 IV: MSI and PLD components: Introduction, Binary adders and subtractors, Decimal adders, Magnitude comparator, Decoders and Encoders, 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: 6, 7.

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: 5.

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


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


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


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.
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.
8. Export marketing: understanding international business environment, Procedures and formalities, Do's and don'ts for exports.
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: Financial 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 understand 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. Project 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)

<table>
<thead>
<tr>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vernier Instruments 01</td>
</tr>
<tr>
<td>a) Vernier Calliper 01</td>
</tr>
<tr>
<td>b) Height guage 01</td>
</tr>
<tr>
<td>c) Depth gauge 01</td>
</tr>
<tr>
<td>d) Dial indicator 01</td>
</tr>
<tr>
<td>Comparator 01</td>
</tr>
<tr>
<td>Interferometer 01</td>
</tr>
<tr>
<td>a) Optical interferometer 01</td>
</tr>
<tr>
<td>b) Laser interferometer 01</td>
</tr>
<tr>
<td>Lathe Machine 01</td>
</tr>
<tr>
<td>Piller type drilling machine 01</td>
</tr>
<tr>
<td>Basic optical devices 01</td>
</tr>
<tr>
<td>a) Telescope 01</td>
</tr>
<tr>
<td>b) Simple Compound Microscope 02</td>
</tr>
<tr>
<td>Different types of prism each 1</td>
</tr>
<tr>
<td>Ophthalmic lenses each 1</td>
</tr>
<tr>
<td>Special glasses each 1</td>
</tr>
<tr>
<td>Vacuum pumps 1</td>
</tr>
<tr>
<td>Electronic Components (Caoacutir, Resistor) each 6</td>
</tr>
<tr>
<td>standard values Inductor, Transformer</td>
</tr>
<tr>
<td>Voltmeter of standard range each 10</td>
</tr>
<tr>
<td>Ammeter of standard range each 10</td>
</tr>
<tr>
<td>Multimeter 05</td>
</tr>
<tr>
<td>D.C.Power supply 05</td>
</tr>
<tr>
<td>Transistors 1 dozen</td>
</tr>
<tr>
<td>Semiconductor diode, Zener, Thermistor, Tunnel 1 dozen</td>
</tr>
<tr>
<td>Audio Oscillator 04</td>
</tr>
<tr>
<td>FET 04</td>
</tr>
<tr>
<td>Mosfet 04</td>
</tr>
<tr>
<td>UJT 02</td>
</tr>
</tbody>
</table>
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.
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-pigeon peas, mung, cowpea, Rabbi-pulses-chickpea, field pea, linseed
3. Oil seeds-mustard, castor, linseed, ground nut
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 pollination
Honey bees, their social structure and management (bee keeping)
Insect control
Definition and methods of insect control via.
Monitoring insect infestation by different tropes
Cultural, mechanical, physucal, quarantine
Chemical control/pre harvest sanitization 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

Unit-IV : Seed Processing and Storage

Unit-I : Place and importance of seed processing in the path way of seed improvement. Concept and objectives of seed processing, physical characteristics used to separate seeds, basic flow pattern in seed processing.
Preprocessing seed for processing the scalper, the dehuller, the scarifier maize, shellcr - licensing of machines.

Seed drying : Importance and advantage of seed drainage, moisture content recalctromit/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 equilibrium moisture content of seeds.
The air screen cleaner cum grader, vibrating 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 efficiency, 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, adjustments of a specific gravity separators, starting and operating sequences, separation problems, and their rectification, recleaning the middling 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 separator, the draper best separator, electrostatic separators, 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 inquiry 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 conveyors, 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, labelling and maintaining lot identity, lot numbers, seed pellets, handling and stacking, maintenance of seed processing records. Seed storage structures : construction, operation and maintance, insulation storage-aeration, air conditioning, dehumidification and stacking, moisture and heat proofing of seed storage structures, seed storage management.

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

APPRAOCHES : Decision making based on production, cost and capital investment, cost analysis law of diminishing 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 soil fertility, weeds and their control, mixed cropping multiple 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 MANAGEMENT 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 stereobinocular microscope
2. Symptoms of important seed borns pathogens
3. Visual examination of dry seeds for disease symptoms
4. Examination of suspensions obtained from 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 born 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 familiarization 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 separator.
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.

**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 adjustment of various farm machines
5. Cost analysis.
6. Farm Planning and Budgeting
7. Record Keeping


**PRACTICAL EXAMINATION**

**DISTRIBUTION OF MARKS**
(Note: Draw neat and well labelled diagrams wherever necessary)

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To calculate the viability of seed by tetrazolium test.</td>
</tr>
<tr>
<td>2. Diagnosis of symptoms of seed-borne pathogens.</td>
</tr>
<tr>
<td>3. Study of the mouth parts, antenna and legs of given insects.</td>
</tr>
<tr>
<td>4. Identify and describe the seed specimens and equipment (M),(N),(O),(P)</td>
</tr>
<tr>
<td>5. Determination of seed moisture content by</td>
</tr>
<tr>
<td>6. Class Record + Viva-Voce</td>
</tr>
<tr>
<td>7. <em>Co-curricular Activity Report</em></td>
</tr>
</tbody>
</table>

Total marks: 30

*"Co-curricular Activity Report" which means 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
B.Sc.PART-III EXAM, 2011

1. Introductory Mycology C.J.Alexopoulos
2. An introduction to fungi J.P.Srivastava
3. Systemic fungicides R.W. Marsh
4. Fungicides in plant diseases control Y.L.Nene and P.N. Thapliyal
5. An annotated list of seed borne disease Mary Noble and M.J.Richardson
6. Systemic fungicides S.C.Vyas
7. Destructive and useful insects by Metcalf and Flint
8. Agricultural Entomology by A.S.Atwal
9. Plant Protection Equipments by O.S. Bindra
     Cooperatively published by National Seeds Corporation, New Delhi, and
     Mississippi State University and USAID.
11. S.M. Handerson, and R.L. Perry, Agricultural Process Engineering, John
    Wiley & Sons.
12. Carl W. Hall, Drying Farm Crops
13. A Chakravarty. Post Harvest Technology of Cereals, Pulses and Oil
    Seeds.
    Bhavan, New Delhi
15. Hunt, D, 1968, Farm Power and Machinery Management, Vth edition,
    10WA State, U.S.A.
16. John E Kadlec, Farm management Decision, Operation control, Prentice
    Hall, Inc Englewood, Chiffs, New jersey, U.S.A.
17. Micheal D Boehlje and Verman R. Eidman, Farm Management John Wiley
    and sons, New York.
    Publishers, India, Ludhiana.
19. 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.
20. V.T. Raju and DVS Rao, Economics of farm Production and

2. COMPUTER APPLICATION

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 Machine, 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, constructors, 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.

Appllet Programming: Appllet basics, difference between appllets and applications, writing appllets, appllet code, appllet life cycle, creating an executable appllets and appllet tag, running the appllets.

**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 client-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 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.

*****

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, acrylic sheets.
   Equipments required, - Tools required, Construction of frameless aquaria.


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.

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.


Economics of fish markets, marketing and resource management. Co-operatives and their role in fish production and marketing. 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.


Programmes on economics of fish production, fish marketing and resources management.

PRACTICALS


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, estuarine, 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 programs on fish culture, Preparing diet programs based on nutritional requirement of fish in correlation with food conversion ratio.

VIII. Computer statistical graphics on batch composition, sale percentage, growth rate, production, etc.

IX. Compulsory Project Work on computer application, 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
Q.1 Tools-1, Aquarium equipment-1, Aquarium fish food-1) - 07 Marks
Q.2 Experiment on aquarium fabrication - 05 Marks
Q.3 Setting of an Aquarium - 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. Aluminium frame
5. Betumin
6. Wooden and Metal hoods

**IV** Facilities
1. Cement cisterns (for fish plant propagation)

**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. TV.
2. VCR.
3. Slide projector
4. Overhead projector
5. Public address system
6. Educational cassettes and CDs.

**VII** Computer, Printer, Scanner.

**REFERENCES**

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:

11. Laboratory manual for food canners and processors VI, National Canners Association Research Laboratories AVI, Westport.
15. Fish curing and processing. Zaitsev, V. P. Issrael program for scientific translation.
26. Introduction to fishery by products. Windsor, and Barlow, Fishing News, Surrey.
1. Record - 05 marks
2. Viva-voce - 10 marks
3. Exercise - 12 marks
4. *Co-curricular Activity - 03 marks

**Report**

Total : 30 marks

*"Co-curricular Activity Report" which means 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 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**:

PAPER VI

(PROCESSING OF FOODS)

**Unit I**: Bakekry & confectionary products: Miling of wheat. Types of flours, Manufacture of bread, biscuits, cakes, cookies. Manufacture of hard boiled confectionary, caramel, fudge, fondant, chocolate. Traditionnal products such as batasha, chikki, rewadi.


**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.


**TEXT BOOKS**:

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.

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. Filtration flask with
   buchner funnel. 250 ml. 8/Batch
6. Separating funnel. 4/Batch
7. Microscopic slides/cover slips. 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
11. Burrettes. 5 ml. 16/Batch
12. Petridishes. 1 ml. 1/Batch
13. Vot Flask 100 ml. 16/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. Burette 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.

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.

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

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PAPER-VI
(PC MAINTENANCE & TROUBLESHOOTING)

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.


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 experiemnt)

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.
7. PC (80286, 8086 XT) Trainer Kits - 3 Nos.
9. Diagnostic Cards (as per syllabus) - 4 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.
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.
26. Computer Spares & Cards related to syllabus - 2 Nos
27. Licensed Softwares related to Syllabus & General functionality.

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/continuous cell lines. Commonly used animal cell lines - their origin and characteristics. Growth kinetics of cells in culture.


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
Entrepreneurship -
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.

Unit-V
Use of markers for selection of hybrid cells.
Practical applications of somatic hybridization (hybrids and cybrids)

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:
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.

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.

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.
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:
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.
15. Biotechnology and Environment : R.N.Trivedi
16. Elements of Biotechnology : P.K.Gupta

LIST OF INSTRUMENTS, EQUIPMENTS WITH SPECIFICATION REQUIRED FOR B.Sc.II AND FINAL BIOTECHNOLOGY.

<table>
<thead>
<tr>
<th>SR.No.</th>
<th>NAME</th>
<th>MAKE</th>
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<tbody>
<tr>
<td>1.</td>
<td>pH Meter</td>
<td>Systronics/Elico J.Mitra/ any std. make</td>
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<td>2.</td>
<td>Autoclave</td>
<td>Yarco/Wiswo or any Std.make</td>
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<td>3.</td>
<td>Incubator</td>
<td>Yarco/Tempo/Lab. Hosp.or any std.make</td>
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<td>4.</td>
<td>Hot air oven</td>
<td>Yarco/Tempo/Lab.Hosp.or any Std.make</td>
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<td>5.</td>
<td>Environmental Growth chamber</td>
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<td>6.</td>
<td>Laboratory Shaker/Platform Shaker</td>
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<td>7.</td>
<td>Colorimeter</td>
<td>Erma/Elicol Systronics or any std.make</td>
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<td>8.</td>
<td>UV-Vis spectrophotometer</td>
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<td>9.</td>
<td>Tissue culture racks with illuminators.</td>
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<td>10.</td>
<td>Verticle &amp; horizontal</td>
<td>Genei/any std.make</td>
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<tr>
<td></td>
<td>electrophoresis apparatus</td>
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<td>with power pack</td>
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<td>11.</td>
<td>Single pan electrical</td>
<td>Systronics/K.Roy contac balance or any std. make</td>
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<tr>
<td>12.</td>
<td>Cyclo-Mixer</td>
<td>Remi/Tempo/or any std.make</td>
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<td>13.</td>
<td>High Speed cooling</td>
<td>Remi C24 + 10X16 ml rotar + 4X100 ml rotar</td>
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<td>centrifuge/with micro centrifuge rotor.</td>
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<td>14.</td>
<td>UV Transilluminator/UV torch, Male Genei/Fotodyne with dual lamps.</td>
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<td>15.</td>
<td>Computer with Internet facility,</td>
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<td>16.</td>
<td>Microscope a Monocular</td>
<td>Olympus/Metzer/Labo.or any other std.make</td>
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</tbody>
</table>

B.Sc.PART-III EXAM, 2011
17. Oil Immersion lens Olympus/Meopta Labo/or any std. make (preferably Imported)  
18. Serological Water bath Yarco/Tempo/Lab Hosp or any std.  
19. Laminar Air-flow Micro filt/or any std.make (to be installed in Asceptic room)  
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. Membrane 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  
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  
l) 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.

List of books recommended:
2) Brown T.A. Gene Cloning - An Introduction, Chapman and Hall India.
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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## Index

**B.Sc. Part-III (Prospectus No. 2011123)**

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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 Evolution by Dr.D.S.Dabhade, Dr.I.A.Raja, Dr.R.A.Gulhane, Dr.A.P.Charjan, A.K.Pathki, 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)

<table>
<thead>
<tr>
<th>Marks</th>
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<tbody>
<tr>
<td>A] a) Aerial photo &amp; satellite imageries interpretation 4</td>
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<tr>
<td>b) Morphometric analysis 3</td>
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<tr>
<td>c) Structural geology problems 3</td>
</tr>
<tr>
<td>d) Section drawing 4</td>
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<tr>
<td>e) Hydrogeology problems 3</td>
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<tr>
<td>f) Exploration problems 3</td>
</tr>
<tr>
<td>B] Sessional + practical records 2</td>
</tr>
<tr>
<td>C] a) *Co-curricular Activity Report 3</td>
</tr>
<tr>
<td>b) Field work 3</td>
</tr>
<tr>
<td>c) Viva 2</td>
</tr>
</tbody>
</table>

TOTAL 30

B.Sc.PART-III

* “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)

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<tr>
<td>1. Phosphatase/Methelene blue reduction test 03</td>
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<tr>
<td>2. Curd Microbiology/Estimation of fat in milk 03</td>
</tr>
<tr>
<td>3. MPN/IMVIC/BOD/MFT standard test for coliform 03</td>
</tr>
<tr>
<td>4. SPC of milk/foods/fruits/canned food 05</td>
</tr>
<tr>
<td>5. Estimation of alcohol/citric acid/isolation of azotobacter/rhizobium/paper chromatography 05</td>
</tr>
<tr>
<td>6. Spotting 05</td>
</tr>
<tr>
<td>7. Viva 04</td>
</tr>
<tr>
<td>8. *Co-curricular activity report 03</td>
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</table>

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)

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<td>Q.1. Long Experiment One Experiment for either Section A/D/E</td>
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<tr>
<td>Q.2. Short Experiment-I One Experiment from section B</td>
</tr>
<tr>
<td>Q.3. Short Experiment-II One Experiment from section C</td>
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<td>Q.4. Record, classwork &amp; Internal Assessment</td>
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<tr>
<td>Q.5. Viva</td>
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<td>Q.6. *Co-Curricular Activity Report</td>
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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)

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<td>(1) Experiment Programme</td>
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<td>(2) Experiment Programme</td>
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<td>(3) *Co-Curricular Activity Report</td>
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<tr>
<td>(4) Viva-Voce</td>
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<td>(5) Record</td>
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</table>

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:

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q.4. Class Record + Viva-Voce</td>
</tr>
<tr>
<td>Q.5. *Co-Curricular Activity Report</td>
</tr>
</tbody>
</table>

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 (PHYSICS)

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Experiment (two experiment)</td>
</tr>
<tr>
<td>2. Sessional work</td>
</tr>
<tr>
<td>3. Viva Voce (3 for each expt.)</td>
</tr>
<tr>
<td>4. *Co-curricular Activity Report</td>
</tr>
</tbody>
</table>

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 (CHEMISTRY)

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Inorganic Chemistry (Exercise)</td>
</tr>
<tr>
<td>b) Organic Chemistry (Exercise)</td>
</tr>
<tr>
<td>c) Physical Chemistry (Exercise)</td>
</tr>
<tr>
<td>d) Record</td>
</tr>
<tr>
<td>e) Viva</td>
</tr>
<tr>
<td>f) *Co-curricular Activity Report</td>
</tr>
</tbody>
</table>

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 (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:

<table>
<thead>
<tr>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q7. Class Record + Viva-Voce</td>
</tr>
<tr>
<td>Q8. *Co-Curricular Activity Report</td>
</tr>
</tbody>
</table>

* “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.
sion, Excursion Tour to be submitted by the students at the time of practical examination.

**DISTRIBUTION OF PRACTICAL MARKS (ZOOLOGY)**

Time: 4 hrs. 

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Identification, classification &amp; comment on spot (fish, aquatics weeds, insects or panktons)</td>
<td>5</td>
</tr>
<tr>
<td>2) Dissection of fish/prawn/insect life cycle.</td>
<td>4</td>
</tr>
<tr>
<td>3) Microtechnique</td>
<td></td>
</tr>
<tr>
<td>a) section cutting &amp; spreading of ribbons</td>
<td>4</td>
</tr>
<tr>
<td>b) staining of the given slide</td>
<td>3</td>
</tr>
<tr>
<td>c) camera lucida drawing of the given object</td>
<td>3</td>
</tr>
<tr>
<td>4) Permanent slides submitted by the examinee (5 slides)</td>
<td>2</td>
</tr>
<tr>
<td>5) Class record (duly signed by teacher incharge and certified by head.)</td>
<td>2</td>
</tr>
<tr>
<td>6) Collection of Animals</td>
<td>2</td>
</tr>
<tr>
<td>7. Viva-voce</td>
<td>2</td>
</tr>
<tr>
<td>8. *Co-curricular Activity Report</td>
<td>3</td>
</tr>
</tbody>
</table>

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))**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One Expt.</td>
<td>09 Marks</td>
</tr>
<tr>
<td>2. Practial record</td>
<td>03 Marks</td>
</tr>
<tr>
<td>3. Viva on Expt.</td>
<td>03 Marks</td>
</tr>
<tr>
<td>4. Project (Experimental)</td>
<td>09 Marks</td>
</tr>
<tr>
<td>5. Project report</td>
<td>03 Marks</td>
</tr>
<tr>
<td>6. *Co-curricular Activity Report</td>
<td>03 Marks</td>
</tr>
</tbody>
</table>

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)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Record</td>
<td>05</td>
</tr>
<tr>
<td>2. Viva-voce</td>
<td>10</td>
</tr>
<tr>
<td>3. Exercise</td>
<td>12</td>
</tr>
<tr>
<td>4. *Co-curricular Activity Report</td>
<td>03</td>
</tr>
</tbody>
</table>

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
*****
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 :-

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.

Recommended Books :-
(2) Bioinformatics and Functional Genomics – Jonathan Persner
(3) S.C.Rastogi, Namita Mendirata, Parag Rastogi, “Bioinformatics concepts skills and application, CBS Publisher.

Practicals :
1. Downloading 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.
8. Visualization of tertiary 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 attributes, 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 privilege, 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 :-


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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