B.Sc. Part-II Exam. 2011 Prospectus No. 2011122

संत गाड़गेबाबा
अमरावती विद्यापीठ
SANT GADGE BABA
AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

अभ्यासक्रिमिका
विज्ञान स्नातक भाग-२ परीक्षा, २०११
(त्रिवर्षीय अभ्यासक्रम)

PROSPECTUS
OF
B.Sc. Part-II Examination, 2011
(Three Year Degree Course)

2010
Visit us at www.sgbau.ac.in
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विद्यापीठाच्या पुरवठेत शिक्षण कोणताही पुनर्ग्रहण करता घेऊयाअहे.'

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

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

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

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.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.
Direction No. 20/2010 : Reassessment of Answer Book on their Demand

D. K. Joshi
Registrar
Sant Gadge Baba
Amravati University.

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

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

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.
(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.
(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.
(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.
(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.
SYLLABUS
Prescribed for
B.Sc. Part-II Examination
1. MATHEMATICS
   (W.E.F. 2004-2005 SESSION)
   PAPER-IV
   ADVANCED CALCULUS

   Unit-I : Sequence : Theorems on limits of sequences, Bounded and monotonically sequences. Cauchy's Convergence Criterion.
   Series : Series of non-negative terms, convergence of Geometric series and the series $\sum \frac{1}{n^p}$. Comparison test, Cauchy's Integral test, Ratio test, Root test. Alternating series. Leibnitz's theorem. Absolute and conditional convergence.


   Unit-V : Directional derivative, gradient, divergence and curl. Expansion formulae for gradient, divergence and curl. Surface and volume integral. Theorem of Gauss, Greens and Stoke's theorem and problems based on these theorems.

References :

8) S.C. Malik and Arora, Mathematical Analysis, Wiley Estern Ltd. New Delhi.
12) Shanti Narayan, A course of Mathematical Analysis, S.Chand and Company, New Delhi.
14) D. Somasundaram and B. Choudhary, A First course in Mathematical Analysis, Narosa Publishing House, New Delhi.

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PAPER-V
DIFFERENTIAL EQUATIONS


Unit-III : Partial differential equations of the first order. Lagrange's solution. Some special types of equations which can be solved easily by methods other than the general method. Charpit's general method of solution. Jacobi's method.


Unit-V : Calculus of Variations - Variational problems with fixed boundaries - Euler's equation for functionals containing first order derivative and one independent variable. Extremals functionals dependent on higher order derivatives. Functionals dependent on more than one independent variable. Variational problems in parametric form. Invariance of Euler's equation under coordinates transformation.

References :
1) T.M.Karade, Lectures on Differential Equations, Sonu Nilu Publication, Nagpur.

PAPER-VI
MECHANICS

Statics :
Unit-I : Analytical conditions of equilibrium of Coplanar forces. Virtual work, Catenary.


Dynamics :
Unit-III : Velocities and accelerations along the coordinate axes, radial and transverse directions and along tangential normal directions. Projectile.

Unit-IV : Motion in resisting medium. Motion of particles of varying mass. Constraints. D'Alembert’s principle and Lagrange's equations.


References :
1) T.M.Karade, Maya S.Bendre, Lectures on Mechanics, Sonu-Nilu Publication Nagpur.
6) S.L.Loney, An Elementary Treatise on Statics, Kalyani Publishers, New Delhi.- Ludhiana
2. GEOLOGY
(Effective from the Session 2004-2005)

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

Paper IV: Earth Processes and Resources.
Paper V: Mineralogy and Petrology.
Paper VI: Earth’s History.

Practical:

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

A] a) Megascopic Minerals and Ores : 5 Marks
   b) Microscopic Minerals : 2 Marks
   c) Megascopic Rocks : 5 Marks
   d) Microscopic Rocks : 3 Marks
   e) Graphic Plotting of Petrochemicals : 2 Marks
   f) Identification of Fossils : 3 Marks

B] Sessional : 2 Marks

C] Field work, Report and Viva-voce : 8 Marks

Total : 30 marks.

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 - IV
Earth Processes and Resources:


UNIT-III: Mineralogy, Uses, Geological occurrences, origin and Geographical distribution in India of the mineral deposits like iron, manganese, chromium, copper, lead, zinc, gold & aluminum.

UNIT-IV: Mineralogy, Uses, Geological occurrences, origin and Geographical distribution in India of the Non-metals related to refractory, fertilizer, cement, chemical and gemstone industry and minerals like asbestos, barite, gypsum, mica, graphite, talc, magnesite.

UNIT-V: Conventional and non-conventional energy resources Coal, petroleum, atomic minerals; and water, sun, wind, hot springs and sea waves.

Paper-V
Mineralogy and Petrology

UNIT-I: Rock forming minerals-silicates, oxides and sulfides: Chemical and physical properties and systematic classification of the following rock forming mineral groups: Quartz, Feldspar, Felspathoids, Zeolites, Pyroxenes, Amphiboles, Micas, Olivine, Garnet and Aluminous Silicates.

UNIT-II: Classification of Igneous Rocks. Rock associations in time and space. Concept of rock series. Mineralogical characteristics of acid igneous, alkaline, basic igneous and ultra-mafic rocks.

UNIT-III: Phase rule and phase equilibria: Concept of system, phases and component. Basic principles of phase equilibrium in one component, two component and three component silicate systems. Phase equilibria and their applications in petrology.
UNIT-IV : Equilibrium and non equilibrium reactions in metamorphic processes, composition - paragenetic diagrams; projective analysis; Metamorphism of pelitic, acidic, basic and calcareous rocks, metasomatism.


Paper VI
Earth's History.

UNIT-I : Ontogeny and variation in fossil assemblages. Applications of palaeontologic data in palaeoecology, evolution, stratigraphy and palaeogeographic and palaeoclimatic reconstruction. Basic ideas about micropalaenontology and microfossils.

UNIT-II : Classification, diagnostic morphological characters, environment and geological distribution of Mollusca, (bivalvia, gastropoda and cephalopoda). Brachiopoda, Echinodermata (Echinoidea and Crinoidea).


UNIT-IV : Lithostratigraphic classification of Indian subcontinent. Classification, geographic distribution, lithological characteristics, fossil contents and economic importance of the following: Archean ; supergroup of peninsular India, Dharwar Supergroup. Sausar Group, Sakoli Group, Dongargarh Supergroup, Arawali Supergroup, Cuddapah Supergroup, Kaladgis, Pakhals, Penganaga Formation, Delhi Supergroup, Vindhyan Supergroup, Kurnool Supergroup, Chattisgarh Supergroup.


Practical :
1. Study of physical and optical properties of rock and ore forming minerals as listed in theory papers.
2. Preparation of maps showing distribution of important ores and other economics minerals in India.
3. Study in morphological characteristics of important fossil phyla designated in theory paper.
4. Exercises in showing the major stratigraphic and litho tectonic units in hand drawn map of India.
5. Megascopic and Microscopic study of major Igneous, Sedimentary and Metamorphic Rocks.
6. Laboratory exercises in graphic plots for petrochemistry and interpretation of paragenetic diagrams.

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

Books Recommended for B.Sc. - II : Geology.
Petroogy :

Mineralogy:
1. H.F. Read: Rutley’s Elements of Mineralogy.
5. Smith: Minerals and Microscopes.

Economic Geology:

Palaeontology:

Indian Stratigraphy:

3. STATISTICS
(Implemented from the session 2004-2005)

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:

- Practical: 5 marks
- Viva voce: 5 marks
- Practical problems: 20 marks

Total: 30 marks

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 college 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-III

Statistical Methods

UNIT-I : Sampling from a Distribution: Definition of a random sample,
drawing random samples from standard distributions (Binomial,
Poisson, Normal, Exponential). Concept of a statistic and its
sampling distribution. Independence of sample mean and
variance in random sampling from a normal distribution (without
derivation), sampling distributions - Chi-square, t, F.

UNIT-II : Sampling distributions of sum of Binomial, Poisson and mean
of normal distribution.

Estimation: Point and interval estimate of a parameter,
unbiasedness, consistency, efficiency and sufficiency. Concept
of bias and standard error of an estimate, standard errors of
sample mean and sample proportion.

Testing of Hypothesis: Concept of hypothesis, null and
alternative hypothesis, types of errors; p-values, level of
significance, power of a test.

UNIT-III : Applications of Sampling distributions: Testing for the mean
and variance of univariate normal distribution, testing of
equality of two means and testing of equality of two variances
of two univariate normal distributions. Introduction to Bivariate
normal distribution. Testing for the significance of sample
correlation coefficient in sampling from a bivariate normal
distribution and for the equality of means and equality of
variances in sampling from a bivariate normal distribution.

UNIT-IV : Large Sample Tests: Statement of Central Limit Theorem. Use
of central limit theorem for testing and interval estimation of
single mean and single proportion, difference of two means
and two proportions. Fisher's z-transformation and its uses.

References:
3) Hodges J.L. and Lehman E.L. (1964) : Basic Concepts of Probability and
   of Statistics, McGraw Hill.
   Beginner's Text, Vol.-II, New Age International (P) Ltd.
6) Rohatgi V.K. (1967) : An Introduction to Probability Theory and
   University Press.
   Sultan Chand.
9) J.D.Gibbons : Non-parametric Statistical Inference.
10) Sydney Siegel : Introductory text for Non-parametric Methods.

PAPER-IV

APPLIED STATISTICS

UNIT-I : Indian Applied Statistical System: Present official statistical
system in India, methods of collection of official statistics,
their reliability and limitations, principal publications containing
such statistics on the topics - population, agriculture, industry,
trade, price, labour and employment, transport and
communications, banking and finance.

UNIT-II : Demographic Methods: Sources of demographic data - Census,
register, adhoc survey, hospital records, demographic profiles of
Indian census.

Measurement of Mortality: Crude death rate, specific death
rate, age-specific death rate, infant mortality rate, standardised death rates (direct and indirect method).

UNIT-III : **Complete Life Table**: It's main features, various elements of life table and their relations, construction of life table, probability of dying, used of life table, stationary and stable population. **Measurement of Fertility**: Crude birth rate, general fertility rate, total fertility rate, specific fertility rate, age-specific fertility rate, measurement of population growth, crude rate of natural increase and vital index, GRR and NRR.

UNIT-IV : **Economic Statistics**: Index number - It's definition, applications of index numbers, price relatives and quantity relatives, volume relatives, link and chain relatives. Problems involved in computation of index numbers, use of averages, simple aggregate and weighted average methods, Laspeyre's, Drowbish-Bowley, Marshall - Edgeworth, Walsch's Passche's and Fisher's index numbers, Time and Factor reversal test, consumers price index (cost of living index number).

UNIT-V : **Time Series Analysis**: Concept of time series, economic time series, its different components and illustrations, additive and multiplicative models, determination of trend, analysis of seasonal fluctuations, construction of seasonal indices. **Demand Analysis**: Static laws of demand and supply, price elasticity of demand, income elasticity and cross elasticity of demand. Pareto's Law of Income distributions.

**References**:

**LIST OF PRACTICALS**:
1) Drawing random samples from Binomial Poisson, Normal and Exponential Distributions.
2) Test of significance based on t-test.
3) Test of significance based on Chi-Square test.
4) Test of significance based on F-test.
5) Testing of significance of sample correlation coefficient and use of Z-transformations.
6) Testing of equality of means and variances in sampling from a bivariate normal distribution.
7) Large Sample test for single means and difference of means.
8) Large Sample test for single proportion and difference of proportions.
9) Chi-square test for goodness of fit.
10) Chi-square test for Independence of attributes in contingency tables.
11) Non - Parametric Test : Sign test for univariate and Bivariate distributions.
13) Non - Parametric Test : Run test.
14) Non - Parametric Test : Median test.
15) Non - Parametric Test : Kolmogorov - Smirnov Test.
16) Computation of various measures of mortality.
17) Standardised death rate by direct and indirect method.
18) Construction of life table.
19) Computation of various measures of fertility.
20) Computation of G.R.R. and N.R.R.
21) Computation of index number by simple aggregate and Weighted average method.
22) Construction of price and quantity index numbers by Laspeyre's, Passche's and Fisher's method.
23) Applications of time reversal test and factor reversal test.
24) Construction of cost of living index numbers.
25) Measurement of linear trend by -
   i) Graphical Method
   ii) Method of Semi averages.
   iii) Method of least squares.
   iv) Method of moving averages.
26) Measurement of seasonal variations by -
   i) Method of simple averages.
   ii) Ratio to trend method.
   iii) Ratio to moving average method.
iv) Method of link relative.

27) Estimation of price elasticity of demand, income elasticity of demand and cross elasticity of demand.

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

For B.Sc.-I, B.Sc.-II and B.Sc.Final :
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 posters and charts - 01
11) Software packages, Like Sistat, 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 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 four hours 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-III
GEOMORPHOLOGY

Unit-I : 1. Meaning and scope of Geomorphology. Relations with the other branches of geography.
2. Origin of the earth. A review of some of the most accepted views on the origin of the earth.

Unit-II : 1. Interior of the earth. Seismological evidence.
2. Diastrophism and Volcanism.

Unit-III : 1. Relief features of the earth. Changing nature of the relief features. Forces bringing changes, Endogenic and Exogenetic forces.

2. Types of rocks. Their role in shaping and affecting the work of denudation forces.

Unit-IV : 1. Denudation through weathering. Types of weathering and their role in geomorphic processes.
2. Denudation through erosion : Agents of erosion : The work of streams and the evolution of valleys.

Unit-V : 1. Concept of the cycle of erosion. Adjustment of streams to Structures.
2. The valley glaciers : Their work and the resulting land forms.

Unit-VI : 1. Process of arid erosion and the arid land forms. The work of streams in arid and semi aride regions.
2. The work of under ground water and the chief features of lime stone topography.

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

PAPER-IV
(ASIA WITH SPECIAL REFERENCE TO INDIA)

Unit-I : 1. Asia-Geographical position, Structural built relief and drainage.
2. Asia-weather conditions, climate and climatic regions.

Unit-II : 1. Asia-Soils vegetation and population.
2. Asia-Agriculture.

2. Asia Industries :
   i) Iron and Steel.
   ii) Textile cotton, Silk and Wool.

Unit-IV : 1. India-Geographical position, structural built, relief and drainage.
2. India-weather conditions, climate and climatic regions.

Unit-V : 1. India-Soils, Vegetation and population.
2. India-Agriculture.

Unit-VI : 1. India-Mineral and Power Resources.
Iron Ore, Banskite, Manganese, tin, Coal, petroleum and Hydro-electricity.

2. Indian Industries.
   i) Iron & Steel
   ii) Cotton Textiles
   iii) Jute

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

PRACTICAL
1. Advanced study of contours, Construction of at least ten exercises, Drawing of longitudinal and transverse profiles.
2. Reading of topographical maps of the Survey of India. Maps at least four.
3. Identification of following rocks and minerals.
4. Construction, merits demerits and choice of the following projections.
   1. Gnomics projection, the polar case.
   2. Stereographic projection, the polar case.
   3. Zenithal Equidistant projection, the polar case.
   4. Zenithal Equal Area projection, the polar case.
   5. Simple Cylindrical Projection.
   7. Simple Conic Projection with one standard parallel.
   8. Simple conic projection with two standard parallel.
   10. The polyconic projection.
5. Surveying by prismatic compass.
   1. Open and close traverse.
   2. Correction of bearings.
   3. Plotting and distribution of error.

STATISTICAL METHOD
6. Study of Central tendencies Mean, Mode and Media.
7. Study Tour - Visit to mines or Agro based Industry.

Note: As per decision of academic council in its meeting held on 16.1.90 maximum number of examinees in Geography practical examination up to B.A/B.Sc. level shall not exceed 40 examination per day.

Plan For Practical Examination.
1. Contours 5 Marks
2. Topographical maps 4 Marks
3. Projection 5 Marks
4. Surveying 5 Marks
5. Statistical Methods 4 Marks
6. Practical Records
   Viva Voce identification of rocks and field report 7 Marks.

Total: 30 Marks

Note: The following certificate will be necessary attached to the Practical Record Note Book of the Examinee when submitted before commencement of the Practical Examination of the subject.

CERTIFICATE
Name of College__________________________________________
This to certify that this Practical Record is the bonafied Practical works of Shri/Kumari/Shrimati __________________________
During the Academic Year __________________
Dated: Signature of the teacher who taught the examinee.
1. 
2. 
3. 
Head of the Department

In the absence of the above certificate marks for Practical Records shall not be awarded to the examinee.

PAPER-III
BOOKS RECOMMENDED:

**PAPER-IV**

**BOOKS RECOMMENDED**

3. Stamp L.D. : Asia
6. Robinson, Monsson Asia, University of London Press.
7. Spali OHK & ATA Lear - Month : India and Pakistan.
10. 繼為fax十i_+ž...}... ±...日本…EÚ…∂…x… {…÷h…‰-2
11. 繼為fax十i_+ž...}... ±...日本…EÚ…∂…x… {…÷h…‰-¶……Æ˙i… EÚ… ∫……®……x™… ¥… |……n‰˘ ∂…EÚ ¶…÷ ¥…Y……x…, x…ÆÂ˙p˘ |…EÚ…∂…x… {…÷h…‰-2.

**PRACTICALS BOOKS RECOMMENDED**


* * *

5. **MICROBIOLOGY**

(Implemented from the session 2004-05)

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. Examinees should attempt all five questions. Theory paper is of three hours duration and shall carry 60 marks each. Each practical examination (each batch of students) will last for at least two consecutive days with minimum five working hours each day. The syllabus is based on six theory periods and six practical periods per week.

**Paper III**

(Molecular Biology and Genetic Engineering)

**Unit I- Gene Multiplication and expression:**

a) Replication of DNA- Modes of replication, (Conservative, Semiconservative and Dispersive). Experiment of Meselson and Stahl to prove semiconservative mode of replication, general features.

b) Genetic code- Characteristic features of genetic code.

c) Out line of Protein synthesis- Transcription and translation.

**Unit II- Gene and Gene Mutation:**

a) Concept of gene – Definition of Gene and experiment of Avery Macleod, McCarty in brief to prove gene as the genetic material. Definition of Muton, recon, cistron, gene within gene, split gene.

b) Gene regulation- Mechanism of Lac operon.


d) Genetic suppressions:- Intragenic (Intracodon suppression, reading frame Suppression) and extragenic suppression, (Non sense and Missense Suppression).

e) Molecular basis of spontaneous and induced mutation

Spontaneous mutation (Tautomism), Induced Mutation (Chemical Mutagens) e.g. Base analogue, Nitrous Oxide, Hydroxylamine, Acridine dyes, Physical mutagens e.g. X-rays, Gamma rays, U.V. light.

**Unit III- Genetic recombination:**

a) Transformation: History in brief, Experiment of Griffith, Avery, MacLeod and McCarty to prove Genetic Transformation. Mechanism of Transformation.

b) Transduction: Mechanism of Transduction. Generalized and Restricted Transduction (Definition and differences). Comparison between Transformation and Transductions.


\[ F^+ \times F^- \]

\[ F^- \rightarrow Hfr \]

\[ Hfr \rightarrow F^- \]

**Unit IV- Tools and techniques of genetic engineering:**

a) Preparation of pure samples of DNA (Isolation of Genomic and Plasmid DNA from bacteria), Enzymes for splicing (Restriction endonucleases),
Range of DNA manipulating enzymes (Nucleases, ligases, polymerases, DNA modifying enzyme, Topo isomerases), Analysis of DNA fragment size (By agarose gel electrophoresis), Joining of DNA molecules (DNA Ligase), Vectors and their types (Plasmid, Cosmid and Viruses).

b) Introducing γ DNA into host cell, competent cells, transduction of cells, identification of transformed cell. (e.g. Antibiotic resistance gene in Plasmid) Selection of clones. Direct (colony hybridization ) and Indirect (southern blotting).

c) Definition and application of gene mapping, DNA sequencing and PCR.

d) Introduction to expression of cloned genes, construction of gene library cells for cloning, Expression of prokaryotic and eukaryotic genes.

Unit V- Applications of Genetic engineering:

a) Health care biotechnology:
   i. Production of Hormones- Insulin. (only biotechnology concept)
   ii. Production of Interferon. (only biotechnology concept)
   iii. Production of vaccines: conventional vaccines, BCG, Salk, Diphtheria, toxoid, ATC., outline of recombinant vaccines (hepatitis)(only biotechnology concept)
   iv. Hybridoma technology and monoclonal antibodies.(only biotechnology concept)
   v. Gene therapy. (Replacement of mutant gene and corrected gene)

b) Agricultural biotechnology (Basic concept only)
   i. Protoplast fusion.
   ii. Bioinsecticide and biopesticides,
   iii. Development of disease free plant.

c) Industrial Biotechnology,
   i. Biopolymers(Xanthan and Dextran).
   ii. Biosensors(Glucose).

d) Ethics and hazards of biotechnology.

Paper IV
(Immunology and Clinical Microbiology)

Unit I- Epidemiology:

a) Definition, classification and scope of epidemiology.

b) Infection- Types of infection and modes of transmission.
b) Rickettias-
   i. *R. prowazekii*
   ii. *R. rickettsii*
   iii. *R. burnetii*
   iv. *R. quintana*

c) Protozoa- *E. histolytica*

d) Fungi- *C. albicans*

Unit V- Antimicrobial chemotherapy:

a) Basic principles of chemotherapy,
b) Drug- microbe- host interaction,
c) Major antimicrobial agents,
d) Basic mechanism of antibiotic action,
e) *In vitro* drug susceptibility tests, Cup, disc, Dilution – Broth and agar methods.
f) General principles and clinical use of antimicrobial drugs.

Practicals

1. Study of enzymes:
   a) Amylase
   b) Catalase
   c) Gelatinase
   d) Urease
   e) Coagulase
   f) Lecithinase
   g) Oxidase

2. Biochemical Tests:
   a) Fermentation of various sugars,
   b) Hydrogen Sulphide production,
   c) Indole production,
   d) Methyl Red test,
   e) Voges Proskauer Test,
   f) Citrate Utilization,
   g) Nitrate reduction Test.

3. Isolation and Identification of following bacteria:
   a) *Staphylococcus aureus*,
   b) *Salmonella typhi*,
   c) *E. coli*.

4. Laboratory cultivation of following pathogens:
   a) *M. tuberculosis*,
   b) *C. diphtheriae*,
   c) *V. cholerae*,
   d) *Cl. tetani*.

5. Serological Tests:
   a) Widal
   b) Pregnancy test
   c) VDRL

6. Antibiotic sensitivity by Disc method.

7. Methods of anaerobic cultivation,

8. Clinical investigations,
   a) Blood grouping and Cross matching,
   b) TLC, DLC,
   c) Hemoglobin estimation,
   d) Test for carbohydrates and Protein in Urine,
   e) Blood glucose and cholesterol,

9. Cultural examination of Urine, Blood, Sputum, Stool, Pus, CSF.

10. Isolation of pathogenic fungi,

11. Molecular Biology practicals,
   a) Isolation of plasmid DNA,
   b) Isolation of genomic DNA from *E. coli*
   c) Ligation
   d) Transformation
   e) Conjugation

12. Study Tour.

**DISTRIBUTION OF MARKS for practical examination**

<table>
<thead>
<tr>
<th>Practical</th>
<th>Marks</th>
</tr>
</thead>
</table>
| Enzymestudy/Molecular Biology Practical | 04
| Serological Tests: Blood grouping/ VDRL/ Widal/ Pregnancy test | 03
| Identification and Antibiotic sensitivity test of the organisms | 08
| TLC/ DLC/ Hemoglobin Estimation/ Test for carbohydrates and proteins in urine/ Blood cholesterol and Blood glucose/ Isolation of Pathogenic fungi | 03
| Spotting | 05
| Viva-voce | 05
| ClassRecord / Study tour report | 02

Total 30
Books Recommended For Paper III :
2. Introduction to Genetic Engineering: - Nicholas
3. An Introduction to Genetic Analysis: - David Suzuki, Anthony. Griffiths
4. Biochemistry: - Lehninger
5. Microbiology Vol I & II: - Powar & Daginawala
6. Molecular Biology of the Cell.: - J. D. Watson, D. Bray
7. The DNA Story: - J. D. Watson
8. Genetics of Prokaryotes: - Srivastava et.al
9. Genes: - Pramod Kumar
10. Genetic Engineering and its Applications - Joshi P.
12. Concept in biotechnology: - D. Balasubramanium

Books Recommended For Paper IV :
1. Medical Bacteriology: Dey N.C. & Day T.K.
3. Text Book of Microbiology: Ananthanarayan R. & C.E. Panikar
5. Dorland’s Pocket Medical Dictionary
6. Microbiology: Zinsser W.
7. Preventive & Social Medicine: Park & Park
9. Medical Microbiology: R. Anantnarayan
13. Parasitology: K.D.Chatterjee

PRACTICALS:
4. Microbiological Methods: Collins
5. Difco manual:

List of Instruments/Equipment 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 required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Autoclave</td>
<td>Yarco/Wiswo or Pressure gauge 0-30 psi size 350X325 mm. Non-Electrical</td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Portable</td>
<td>any Std. make</td>
<td>Double Walled</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>S.basket, cord &amp; plug to work on 220 V. pressure control switch chamber size.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hot-air oven</td>
<td>Yarco/Tempo/ Lab.Hosp. or any make</td>
<td>Double walled. Thermostat, Temp. regulator. Size 45X45X45 cm.</td>
<td>2.</td>
</tr>
<tr>
<td>3</td>
<td>Incubator</td>
<td>Yarco/Tempo/Lab. Hosp. or any std. make</td>
<td>Double walled insulated Temp. regulator size Temp. upto 60 C</td>
<td>2.</td>
</tr>
<tr>
<td>No.</td>
<td>Equipment</td>
<td>Make/Model</td>
<td>Features/Specifications</td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>5.</td>
<td>Refrigerator</td>
<td>Godrej/Kelvinator/BPL/std.</td>
<td>with thermostat sensitivity +0.5 C, size 45X45X45cm, double/tripple door with 250/300 Lit. capacity having separate freezer. Double walled, thermoregulated. Max. Temp. upto 80°C, size 12X12X12&quot; with cover.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Serological Water bath</td>
<td>Yarco/Tempo/Remi Hosp or any std.</td>
<td></td>
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</tr>
<tr>
<td>7.</td>
<td>Magnetic Stirrer with hot plate</td>
<td>Yarco/Tempo/Remi Lab Hosp./or any std. make</td>
<td>2 L. Capacity with 500 Wt. temp. regulated hot plate. For one test tube only. With replaceable swing out rotorheads one to hold 8-16 tubes of 15 ml capacity. Another head to hold 4 tubes of 50-100 ml. capacity.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Cyclo-Mixer</td>
<td>Remi/Tempo/or any std. make</td>
<td></td>
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</tr>
<tr>
<td>9.</td>
<td>Centrifuge</td>
<td>Remi R-8c/Yarco or any std make</td>
<td></td>
<td></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. Single cell with either glass or quartz cuvetters. Visible range with coloured filters.</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Colorimeter</td>
<td>Erma/Elicol Systronics or any std. make</td>
<td></td>
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</tr>
<tr>
<td>12.</td>
<td>Distillation Assembly</td>
<td>Remi/Tempo/Lab. Hosp or any std. make</td>
<td>2 Lits./hr. Capacity with metal condensor.</td>
<td></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></td>
</tr>
<tr>
<td>14.</td>
<td>Mixer</td>
<td>Sumit/Jyoti/or any std make</td>
<td>With 3 Jars and Timer.</td>
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<tr>
<td>15.</td>
<td>Single pan balance (triple beam)</td>
<td>National/Remi/or any std make</td>
<td>III gram Capacity</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Anaerobic Jar</td>
<td>Dynomicro/or any std. make</td>
<td>Capacity 10 Petri dishes Complete set.</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Rotary shaker</td>
<td>Yarco/Tempo/Remi or any std make</td>
<td>Flask Capacity 36 flask or 250 ml. Mechanical Variable speed motion size 24X24&quot; platform.</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Automatic Pipette washer</td>
<td>Kumar/Modern or any std. make</td>
<td>Stainless steel 1 ml, 5 ml, 10 ml. Capacities</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Over head Projector</td>
<td>Metzer/photophone or any std. make</td>
<td>Complete with screen 72X50&quot;. Glass screen 16X16&quot;.</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Membrane Filter</td>
<td>Yarco/Tempo/or any std. make</td>
<td>With Vacuum pump 0.5 h.p. Filter funnel Adaptor, Filtering Flask. Membrane filters 0.45 mm and 0.22 mm, for 125 filters complete set.</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Microscope</td>
<td>Olympus/Remi/ Monocular Labo. or any std. make</td>
<td>Straight, with mechanical stage, mirror, objectives 10X, 45X &amp; 100X. Eye piece 5X, 10X &amp; 15X.</td>
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<tr>
<td>22.</td>
<td>Binocular Olympus/Meister Labo. or any std make</td>
<td>Inclined with Mechanical Stage, Mirror, Lighting arrangement objectives 10X, 45X, 100X. Eye piece 5X, 10X and 15X.</td>
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<tr>
<td>23.</td>
<td>Oil Labo/or any std make (preferably Imported.)</td>
<td>Original (Imported) with good spring load.</td>
<td></td>
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<tr>
<td>24.</td>
<td>Autolet Ames or any std make</td>
<td>With lancet holder, lancet cover end cap.</td>
<td></td>
<td></td>
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<tr>
<td>25.</td>
<td>Laminar Flow (Hozt.) (to be installed in Aspetic room)</td>
<td>Complete with U.V. light HEPA filter stainless steel top. Side glass Window pressure 25mm w.g. at rated flow D.O.P. efficiency 99.97% blower 1/4 hp. Size 3’X2’, 4’X2’.</td>
<td></td>
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<tr>
<td>26.</td>
<td>Ultra-violet Light (to be Fitted in Aspetic Room)</td>
<td>Amtrex/Videocon or std make 15 Watts/30 Watts of variable length.</td>
<td></td>
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<tr>
<td>27.</td>
<td>Air-Conditioner(toBe Installed in Aspetic Room)</td>
<td>Amtrex/Videocon or any std make Window Room A/C at list 1.5 ton capacity special filter for dust free air 4 way air distribution Noiseless standard compressors. Dimension 10’X10’ with Air-conditioner and U.V. light</td>
<td></td>
<td></td>
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<tr>
<td>28.</td>
<td>Aspetic room Totally enclosed with air-conditioner</td>
<td>10’X10’</td>
<td></td>
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<tr>
<td>29.</td>
<td>B.O.D. Incubator Toshiba/Kumar Remi or any std make.</td>
<td>Chamber size 45’X45’X45x digital Temp range 5 C-60 C sensitivity</td>
<td></td>
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</tr>
<tr>
<td>30.</td>
<td>Teaching aids Metzer/Photophone or any std make</td>
<td>Metzer/Photophone 500 W. Imported Halogen illumination both for Diascopic projection with powerful and Noiseless cooling system. An astigmatic lenses and Reflecting mirrors.</td>
<td></td>
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</tr>
<tr>
<td>31.</td>
<td>Slide Projector Metzer/Photophone</td>
<td>300 W. Imported</td>
<td>Projection bulb Noiseless cooling system. Slide carrier for slides 2”x2” and film strip carries with mask for 35 mm A best quality projection lenses B German lenses 85 mm f.2.8 coated lens.</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Video Cassettes Imported</td>
<td>Indian/Videocon or std make Practical Microbiology each Applied Microbiology, (Environment, food, Industrial and medical Microbiology)</td>
<td></td>
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<tr>
<td>33.</td>
<td>V.C.R. &amp; T.V. set</td>
<td>National/ Sony/Philips/ Videocon or any std make Recording &amp; playing facility T.V. 21” with remote control.</td>
<td></td>
<td></td>
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</tbody>
</table>
| 34. | Computer with printer and legal softwars. | Intel pentium or any standard make. Current configuration 1
6. BIOCHEMISTRY
(Effective from the session 2004-05)

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-III
INTERMEDIARY METABOLISM

Unit-I: Carbohydrate Metabolism: Glycogen synthesis in liver and muscles, Glycolysis, Glycogenolysis, Tricarboxylic acid cycle, HMP pathway, Gluconeogenesis, Glyoxalate bypass. Regulation of Glycolysis and TCA cycle, Mitochondrial ETC and Oxidative Phosphorylation, Photosynthetic ETC and cyclic and non-cyclic photophosphorylation.

Unit-II: Lipid Metabolism: Introduction, hydrolysis of triacylglycerols, transport of fatty acids into mitochondria, β-oxidation of saturated fatty acids, ATP yield from fatty acid oxidation, Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies, oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol; Regulation of cholesterol metabolism.

Unit-III: Amino acid Metabolism: General reactions of amino acid metabolism; transamination, oxidative deamination and decarboxylation. Urea cycle, Degradation and biosynthesis of amino acids, like Glycine, Serine, Threonine, Cysteine, Methionine, Leucine, Phenylalanine and Tyrosine.

Unit-IV: Nucleotide Metabolism: Sources of the atoms in the purine and pyrimidine molecules. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis.

Unit-V: Porphyrin Metabolism: Biosynthesis and degradation of porphyrines. Production of bile pigments.
Practicals: (Note: A minimum of 10 experiments to be performed from the following)

1. Estimation of blood glucose by GOD/POD method.
2. Isolation of glycogen from liver and estimation by GOD/POD method.
3. Demonstration of effect of temperature on enzyme catalysed reaction.
4. Estimation of Vit-C by dye method.
5. Determination of achromatic point of salivary amylase.
6. Demonstration of urease activity (quantitatively) on urea.
7. Estimation of DNA by Diphenylamine reagent.
8. Estimation of RNA by Orcinol reagent.
10. Separation of chlorophylls by column chromatography.
15. Study tour shall be compulsory for all students.

DISTRIBUTION OF MARKS FOR ANNUAL PRACTICAL EXAMINATION:

Q.1 Long Experiment 10
Q.2 Short Experiment 05
Q.3 Short Experiment 05
Q.4 Viva-Voce 04
Q.5 Class Record & Work, 06

Study tour.

BOOK RECOMMENDED FOR PAPER-III

5. Text Book of Food & Nutrition by A.N. Ghei & Ghei.

FOR PAPER-IV

2. Textbook of medical physiology by A.C. Guyton.
3. Handbook of Human Physiology by Dr. Vidya Ratan.
5. Human Physiology by Vander, A.J. Sherman, J.H & Luciano D.S.
6. Text book of Physiology and Biochemistry by Bell, Davidson and Sarboranq.
7. General Endocrinology by Turner C.D.

LIST OF INSTRUMENTS/EQUIPMENTS/GLASS-WARE AND SPECIFICATION REQUIRED FOR (BIOCHEMISTRY) LAB.

<table>
<thead>
<tr>
<th>Instruments/Equipments</th>
<th>Make</th>
<th>Specification</th>
<th>Quantity required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Photoelectric Colorimeter</td>
<td>Erma Japan</td>
<td>Single cell with either glass or quartz,</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Elico, Specol</td>
<td>Cistronic</td>
<td></td>
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<tr>
<td></td>
<td>Cistronic</td>
<td>Amil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J. Mitra</td>
<td>Instrumentation or any one</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cuvettes visible range with coloured filters.</td>
<td></td>
</tr>
<tr>
<td>2. pH Meter</td>
<td>Elico,</td>
<td>with glass electrode pH Scale from 0 to 14</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cistronic</td>
<td>Resistant to temp change.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>J. Mitra</td>
<td>Instrumentation</td>
<td></td>
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<td></td>
<td></td>
<td>with replaceable swing out rotor heads. One to</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>hold 8-16 tuber of 15 ml capacity another head to</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>hold 4 tuber of 50-100 capacity.</td>
<td></td>
</tr>
<tr>
<td>3. Table centrifuge</td>
<td>“Remi” Model R-8c</td>
<td>Tempo.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Tempo.</td>
<td>Double walled insulated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lab. Hosp.</td>
<td>Double doors. (Inner glass door) Tempo. upto 60 C</td>
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<td></td>
<td></td>
<td>with thermostat.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| 5.  | Hot air Oven  
Yarco Tempo, Lab.Hosp.  
Sensitivity  
+0.5 C Size :  
455x605x455mm  
Thermostat  
Temperature regulator Size :  
45x45x45 cm  
Doubled walled  
Lab.Hosp. Temperature regulator  
Yarco or any make |
| 6.  | Refrigerator  
Voltas, Godrej,  
Allwyn, Kelvinator or any make  
Double door with  
300 Lit. Capacity having separate  
Kelvinator freezer  
Lab.Hosp. temperature regulator  
Yarco or any make |
| 7.  | Serological water bath  
Tempo, Lab.Hosp,  
Yarco or any make  
Double walled  
Thermoregulated  
Mix.Temp.upto  
80°C Size :  
12x15x12 cm with cover. |
| 8.  | Magnetic Stirrer with out plate  
Tempo Remi  
Lab.Hosp.  
Yarco or any make  
2 Lit. Capacity  
with 500 Wt. temp. regulated hot plate |
| 9.  | Metal water Distillation plant  
Remi Tempo  
Lab.Hosp.  
2Lits/Hr.  
Capacity with metal condensor  
Lab.Hosp. round with  
3 way control switch  
100 Watts. |
| 10. | Thin Layer Chromatography Assembly  
—  
—  
—  
Chamber of Glass  
Tank Spreader  
Glass Plates  
Stage for glass plates. |
| 11. | Hot Plate  
Tempo, Remi, Lab.Hosp. or any make  
Round with  
3 way control switch  
100 Watts. |
| 12. | Mixer  
Remi Sumit and/or  
3 jars and timer. |
| 13. | Single Pan Balance  
National Scientific Work  
VARANASI  
(Triple beam)  
100 gm. capacity |
| 14. | One Pan Electric Balance  
Instruments works.  
VARANASI  
100 gm. Capacity  
Accuracy upto 4th decimal of gm. |
| 15. | Cyclo-Mixer  
Vortex Remi  
For one test tube only. |
| 16. | Laboratory Microscope  
Olympus Monocular Medical microscope with sliding stage.  
Remi or any make  
VARANASI |
| 17. | Fingure prickling needle.  
Auto Let Japan  
with Disposable Needler. |
| 18. | Haemometer GDR  
Sahil’s make or Top  
Glass, Tube and Hb pipettes.  
with Comparator  
2 |
| 19. | Neubauer’s Counting Chambers  
with Bright rullings. |
| 20. | RBC Pipettes  
GDR or England make  
England make or any make  
25 Nos. |
| 21. | WBC Pipettes  
do-  
25 Nos. |
any make  
5 Nos. |
<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>Test Tubes</td>
<td>Borosil/Corning/Vensil</td>
<td>20 ml capacity</td>
<td>1000 Nos.</td>
</tr>
<tr>
<td>2.</td>
<td>Centrifuge</td>
<td>Borosil/Corning/Vensil</td>
<td>15 ml Capacity</td>
<td>100 Nos.</td>
</tr>
<tr>
<td>3.</td>
<td>Follin-Wu Tubes</td>
<td>Corning/Borosil/Vensil</td>
<td>25 ml capacity with bulb</td>
<td>50 Nos.</td>
</tr>
<tr>
<td>4.</td>
<td>Nesseler’s Tubes</td>
<td>Corning/Borosil/Vensil</td>
<td>25 ml capacity with 12.5 ml mark</td>
<td>50 Nos.</td>
</tr>
<tr>
<td>5.</td>
<td>Boiling Tubes (Hard glass)</td>
<td>Corning/Borosil/Vensil</td>
<td>50 ml capacity</td>
<td>60 Nos.</td>
</tr>
<tr>
<td>7.</td>
<td>Burettes</td>
<td>Emkay or any make</td>
<td>10 ml capacity with stop clock</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>8.</td>
<td>Microburettes</td>
<td>Borosil/Emkay</td>
<td>10 ml capacity</td>
<td>10 Nos.</td>
</tr>
<tr>
<td>9.</td>
<td>Pipettes</td>
<td>Corning/Borosil/Vensil</td>
<td>10 ml capacity with graduation</td>
<td>20 Nos.</td>
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<td></td>
<td></td>
<td></td>
<td>5 ml capacity with graduation zero at tip.</td>
<td>20 Nos.</td>
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<td></td>
<td>2 ml capacity with graduation zero at tip.</td>
<td>20 Nos.</td>
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<td></td>
<td></td>
<td></td>
<td>1 ml capacity (graduated)</td>
<td>20 Nos.</td>
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<td></td>
<td></td>
<td></td>
<td>0.2 ml capacity (graduated)</td>
<td>20 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.1 ml capacity (graduated)</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>10.</td>
<td>Measuring</td>
<td>Corning/Borosil/Vensil</td>
<td>1000 ml graduated</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 ml graduated</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 ml capacity with graduation</td>
<td>5 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 ml capacity with graduation</td>
<td>5 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 ml capacity with graduation</td>
<td>3 Nos.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>500 ml capacity</td>
<td>5 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 ml capacity</td>
<td>12 Nos.</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>100 ml capacity</td>
<td>20 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 ml capacity</td>
<td>50 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 ml capacity</td>
<td>50 Nos.</td>
</tr>
<tr>
<td>13.</td>
<td>Conical Flasks</td>
<td>Corning/Borosil/Vensil</td>
<td>500 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 ml capacity</td>
<td>30 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Lit. Capacity</td>
<td>5 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>500 ml capacity</td>
<td>100 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>250 ml capacity</td>
<td>100 Nos.</td>
</tr>
<tr>
<td>15.</td>
<td>Dropping Bottle</td>
<td>Emkay</td>
<td>100 ml Capacity</td>
<td>10 Nos.</td>
</tr>
<tr>
<td>16.</td>
<td>Flat Bottom Round Flask</td>
<td>Emkay</td>
<td>500 ml capacity</td>
<td>20 Nos.</td>
</tr>
<tr>
<td>17.</td>
<td>Funnels</td>
<td>Emkay</td>
<td>2.5” diameter</td>
<td>20 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3” diameter</td>
<td>20 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6” diameter</td>
<td>3 Nos.</td>
</tr>
<tr>
<td>18.</td>
<td>Glass Tubing</td>
<td>1/2 mm</td>
<td>1 kg.</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Glass Rods</td>
<td>1/2 mm</td>
<td>1 kg.</td>
<td></td>
</tr>
</tbody>
</table>
Each unit of theory paper will carry two questions with internal options to solve any one question.

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

Candidates are required to pass separately in theory and practical.

In case of programming language standard ANSI version of languages is to be followed.

### Paper-III

**Object Oriented Programming With C++**

**Unit-I**
- OOP paradigm: features of oop, advantages and application of oops, comparison with structured programming languages.
- Introduction to C++, structure of C++ program, tokens, keywords, identifiers, basic data types & user defined data types.

**Unit-II**
- Operators: Scope resolution operators, member dereferencing operators, implicit & explicit conversions.
- Control Structures: if, switch, do---while, while & for statements.
- Functions: Functions prototype, function calling and returning & their types, inline functions, default arguments, const arguments, function overloading.

**Unit-III**
- Classes and Objects: Data abstraction and Encapsulation, Data Hiding, class specification, defining objects, accessing class member, defining member functions, Nesting of member function, friend functions, passing objects as arguments, Returning objects from functions.

**Unit-IV**
- Dynamic Objects: Introduction, dynamic binding, arrays of objects, pointers to objects, this pointer, dynamic constructor.

**Unit-V**
- Inheritance: Introduction, derived classes, single inheritance, multiple inheritance, multilevel inheritance. Hierarchical & Hybrid inheritance. Templates: function, class, members and function
Unit VI: Virtual functions and Polymorphism:
- Introduction, pointers to derived class, definition of virtual functions, pure virtual functions.
- Rules for virtual functions.

Working with files:
- Introduction, hierarchy of file stream classes, opening and closing of files, file modes, file pointers and their manipulations, file input/output with fstream class.

Books Recommended:
1) Object-oriented programming with C++ - E. Balguruswamy, TMH.
2) Mastering C++ - K. R. Venugopalan
3) Programming with C++ - Robert Lafore
4) Programming with C++ - R. S. Nisar Ali

Paper IV
Networking and Web Designing
Unit I:
- Basic elements of communication system: Network concept, advantages, goals, network topologies: star, ring, completely connected N/W, Hybrid N/W, multi-point N/W, LAN, WAN, OSI model.

Unit II:
- HTML: Introduction, need of HTML, HTML tags and attributes: Adding tags, include attributes <HTML>, <HEAD>, <TITLE>, <BODY>, <P>, <BR>, <HR>, Heading tags, table tags, <A>, <LINK>, <IMG>, <ROWSpan>, <COLUMNSpan>, <MARQUEE>, <BLOCKQUOTE>, list tag, Attributes: align, background colour, text color.

Unit III:
- Style sheet, advantages of style sheet, CSS: Introduction, CSS style sheet properties: Units, classes and ID attributes; properties: Text, font, colour, background, border, display, height, line, margin, width; CSS with HTML.

Unit IV:

Unit V:
- Document Type Definition (DTD): Introduction, need of DTD, what is DTD?, declaring elements, element content models, declaring attributes, attribute types, internal and external DTD; entities and their types.

Unit VI:

Books Recommended:
2) Local Area Network - Keiser, TMH Publication.
3) Computer Networks, Andrew S. Tenenbaum, PHI Publication.
5) Teach Yourself XML in 21 days, BPB Publications.
6) XML unleashed, BPB Publications.
7) Teach Yourself XML in 24 hours, BPB Publications.
9) Inside XML, BPB Publications.

Practicals:
Group A: Minimum 16 practicals based on C++ covering all aspects of syllabus.
AND
Group B: Minimum 16 practicals based on XML covering all aspects of syllabus.

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

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

I) Hardware:
a) Computer Terminals: 10 Nos.
- Desirable configuration: Computer with latest configuration.
b) Printer (DMP): 2 Nos.
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.

8. ENVIRONMENTAL SCIENCE
(Implemented revised syllabi from the Session 2007-08)

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

The examination shall consists of two 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 60 marks. The practical examination shall be of four hours duration and carry 30 marks.

PAPER-IV
ENVIRONMENTAL CHEMISTRY

UNIT-I : Fundamentals of Environmental Chemistry :-
- Stoichiometry, Gibb’s Energy, Chemical Potential, Chemical Equilibria, Acid base reaction, Solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionucleotides, composition and properties of Water.

UNIT-II : A) Introduction to surface chemistry - Coagulation, flocculation, adsorption, ion exchange, absorption, and its application in the Environment.
B) Chemistry of Biological important elements - The role of macro and micro elements on life processes - Carbon, Nitrogen, Sulphur, Phosphorous, Hydrogen, Oxygen, Sodium, Potassium, Calcium, Magnesium.

B) Enzymes, Definition, Nomenclature and Properties.

UNIT-IV : A) Toxicology - Introduction and basic concepts. Evaluation of toxicity, rates of exposure, acute, sub-acute and chronic toxicity.
B) Toxic agents in Environment - Pesticides, agrochemicals, drugs, four additives, atmospheric toxicants.


PAPER-V
ENVIRONMENTAL BIOLOGY

UNIT-I : Auctecology of Species :-
- Bouyancy - Definition, adaptive devices to remain floating. Swim bladder in fishes.
- Mimicry - Definition, types, colour change mechanism with respect to environmental changes.
- Biological rhythms - Definition, circadian & circannual rhythm. Endogeneous & exogeneous rhythm.

UNIT-II : Adaptations of Animals with reference to -
B) Aquatic Adaptations - Hydrocoles, Sec.Hydrocoles.

B) Bio-indicators & their role in Environment.
   i) Indicators of Pollution
   ii) Indicators of Climate
   iii) Indicators of Soil Condition

UNIT-IV : Role of Environmental Factors on following plant processes-
i) Uptake of Water & Salts - Soil Water, Conc. of soil solution, soil aeration, interaction of ions, soil pH.
ii) Transpiration - Humidity of Air, temperature, wind velocity, light, atmospheric pressure, water content of soil.
iii) Photosynthesis - Light, CO₂, temperature, H₂O, O₂, and mineral elements in soil.
B.SC.PART-II EXAM, 2011

Energy Sources :- Classification, renewable and non renewable conventional - Coal, Hydrogeothermal nuclear and petroleum, its smart description and their impact.

UNIT-V : Water Microbiology :-
A) Water borne pathology, sources of micro-organisms to water borne pathogens (Bacterial, viral, protozoans & Helminths), Diseases caused by water borne pathogens, significance of bacteriological analysis, indicators of real pollution.
B) Biodiversity - Definition, Scope, types, Biodiversity loss, Global Diversity, India as a mega diversity nation, bio-diversity hot spots.

PAPER-VI
ENVIRONMENTAL EDUCATION, HEALTH, & ENERGY RESOURCES


Experiments based on Papers :
1) To study the process of coagulation by using Alum & FeCl₃.
2) To study the process of adsorption by using adsorbent.
3) To study the process of Ion exchange by using resins.
4) Determination of Amylase activity on starch.
5) To study the effect of temperature on the activity of Enzymes.
6) Estimation of LC50 in fishes.
7) Separation of metal ion by paper chromatography.
8) Analysis of water for bacteriological - MPN.
9) To estimate settleable particulate material in your area.
10) Measurement of noise level noise level meter.
11) Determination of Path of Water.
12) Comparative rate of photosynthesis under variable conditions of CO₂, light, temperature.
13) To study effect of light, temperature, humidity & wind velocity on transpiration.
14) Quantitative analysis of Phytoplanktions & Zooplanktions.
15) Qualitative analysis of Phyto & Zooplanktions.
16) Collection of water sample and its preservation for bacteriological analysis.

Practical Syllabus for Spotting :
1) Identification of Phytoplanktons : Members of cyanophyceae, chlorophyceae, Bacillariophyceae, Xanthophyceae, Diatoms.
2) Identification of Zooplanktons : Protozoans, Crustaceans, Daphnia, Rotifers, Copepods.
3) Adaptations of Plants - Study of Adaptation of Plants growing in different habitats.
   i) Hydrophytes, ii) Xerophytes.

Note: Visit to water works / pond ecosystem / lake / river. Students should submit a detailed report.
- Visit to Thermal Power Station.
- Visit to wind mills.
- Visit to Hydro Electric Power Station.

Distribution of Marks :
Q.1 Any one Experiment on Environmental Pollution / Chemistry. - 06
Q.2 Any one Experiment on Environmental Biology - 06
Q.3 Preparation of temporary slide of phytoplankons / zooplanktons from given water sample. - 04
Q.4 Spotting
   Spot No.1 : Phytoplanktons
   Spot No.2 : Zooplanktons
   Spot No.3 : Any one experiment of Plant Adaptation - 03
Q.5 Practical Record and field diary. - 02
Q.6 Field Diary - 03
Q.7 Viva-Voce. - 06

Books Recommended :-
1) Ecology and Environment :- P.D.Sharma
3) Environmental Chemistry :- B.K.Sharma
4) Water and Hydrology - Peter B.Black
5) Physico Chemical Examination of Water, Sewage & Industrial effluent - N.Manivaskam
8) Chemicals in the Environment - Y.Miab & M.Satake
9) Environmental Chemistry - A.K.Ok
12) Principles of Toxicology - Cassarett & Doulls
13) Essentials of Toxicology - Louis T.A., Leae Fabiger
14) Environmental Biology - K.C.Agrawal
15) Chemical and Biological Methods for Water Pollution Studies - Trivedi & Goel.
16) Fundamental of Environmental Pollution - Kanna K.
17) Environmental Chemistry - De A.K.
18) A text book of Environmental Chemistry - Dara, S.S.
19) Air Pollution - Kudesia, V.P.
20) A Text Book of Environmental Chemistry & Pollution Control - Dara, S.S.
21) Environmental Pollution & Control - Bhatiya, S.C.
22) A Text Book of Environment - Agrawal K.M.
23) Fundamentals of Air Pollution - Raju
24) Air Pollution & Control - Muralikrishna
25) Air Pollution - Rao M.N.
26) Chemical Methods for Environmental Analysis - Rameth R.
27) Environmental Chemistry by Dara

9/10.INDUSTRIAL CHEMISTRY /
INDUSTRIAL CHEMISTRY (VOCATIONAL)

There shall be the following papers and practicals for B.Sc.II 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-IV**

Material Science

Unit I

(A) Classification of materials : (brief idea) crystalline & amorphous, conducting, semiconducting & insulating material.

(b) Metals and Alloys
   (i) Properties of metals (mechanical & electrical properties)
   (ii) Types of alloys - ferrous & non ferrous alloys : composition, Properties and applications of following.
      (a) Mild steel, carbon steel, Mn & V-steels, Stainless steel.
      (b) Copper, brass, bronze, gunmetal
      (c) Al, alloys with Mg.
      (d) Ni, monel, cupra nickel, invar.
      (e) Ti & its important alloys.

Unit II

Ceramics, Refractories & Glasses

(A) Ceramics : Introduction, types, raw materials, manufacturing processes, properties & applications.

Refractories : Introduction, classification & manufacture, Properties applications of fire clay bricks & high alumina bricks.

(B) Glasses : Introduction, types, Composition, manufacture (raw material, batch process) properties and applications.
Unit III  Cement
Introduction Types of cement, raw material in the manufacturing process, wet & dry process, setting & hardening of cement. Properties of cement specification & Testing of cement (tensile, compression, fineness, sp. gravity)
Analysis of cement : Determination of moisture, Ca by complexometry & SiO₂ gravimetrically. Blending of cement.

Unit IV  Polymer
Introduction, classification (Natural - artificial, Inorganic-organic, Thermosetting-thermoplastics), classification of polymerisation processes (addition & condensation polymerisation mechanism not expected) manufacture & application of polyethylene, polystyrene, Polyvinyl chloride (PVC) Polyester (PET), nylons, Teflon.
Phenol-formaldehyde & urea-formaldehyde, resins. Properties and Industrial applications of polymers.

Unit V  Corrosion & Passivity
(A) Corrosion- Introduction, Types of corrosion (Galvanic, open-air,under-water & under ground) Mechanism of corrosion, factors affecting corrosion.
(B) Methods adopted for preventing corrosion (metal coating processes)
(i) Galvanization of Iron.
(ii) Nickel Plating.
(C) Oil Paints & Varnishes :Introduction, manufacture & their applications in prevention corrosion.

Paper-V  Unit Processes in Organic Chemical Manufacture
Unit I  Nitrations and Aminations
(A) Nitrations : Introduction, Nitrating agents; Kinetics and thermodynamic of nitrations of
(i) Benzene to nitrobenzene and m-dinitrobenzene.
(ii) Chlorobenzene to O & p-nitrochloro benzenes.

(B) Aminations by reduction : Methods of reduction by metal, acid, hydrogen, sulphide, alkalisulphite, metal hydrides, sodium metal, cathodic reduction, Manufacture of aniline, m-nitroaniline & p-a-minophenol.

Unit II  Halogenation & Sulphonation
(A) Halogenation : Introduction, kinetics and reagents of halogenation, Nuclear and side chain aromatic halogenation. Manufacture of chlorobenzene, chloral, monochloroacetic acid and dichlorofluoromethane.

Unit III  Oxidation and Hydrogenation
(A) Oxidation : Introduction, various oxidising agents, mechanism and kinetics of oxidation, liquid and vapour phase oxidation, Manufacture of benzoic acid, maleic anhydride, acetaldehyde and acetic acid.
(B) Hydrogenation : Introduction, Kinetics and thermodynamics, various catalysts used for hydrogenation. Hydrogenation of vegetable oil and manufacture of methanol from carbon monoxide and hydrogen.

Unit IV  Alkylation and Aminolysis
(A) Alkylation : Introduction, alkylating agents, thermodynamics and mechanism of alkylation. Manufactures of alkylbenzene (for detergent manufacture), ethylbenzene, phenyl ethyl alcohol.
(b) Aminolysis : Introduction, aminating agents, factors affecting aminolysis.

Unit V  Esterification and Hydrolysis
(A) Esterification : Introduction, Kinetics and thermodynamics of esterification. Esterification of organic acids using unsaturated
compounds. Manufacture of ethyl acetate, vinyl acetate and cellulose acetate.

(B) Hydrolysis: Introduction, Kinetics, thermodynamics and mechanism of hydrolysis and various hydrolysis agents.

Paper-VI

Industrial Pollution and Control Measures

Unit I Water Pollution Due to Industrial Effluents.

Classification of Water: Sea Water, Surface Water (River, Lake Pond) and ground water (Well, Tube Well, Stream); their properties in brief.

Water quality parameters: pH, Hardness, alkalinity, acidity, TDS, DO, COD and BOD. IS and WHO standards of water quality.

Inorganic Pollutants e.g. Heavy metals, Pb, Hg, As, Cd, Cr, Ni, Cu, mineral acids, alkalis, nitrates, Sulphides fluorides, phosphates etc and their sources (Inorganic based industries).

Organic Pollutants, e.g. Phenols, detergents, dyes, pesticides oils, greases etc. and their sources (organic based industries); Effects of these pollutants on water quality.

Water Pollution Monitoring: Methods of Collection of water samples from water bodies and industrial effluents and assessment of water qualities like pH, DO, Hardness, BOD. Determination of Phenol and fluorides in water. Case studies - water Pollution due to paper and sugar industries.

Unit II Water and Waste Water Treatment.

(A) Water Treatment

Methods for water treatment: Sedimentation, filtration, coagulation, sterilisation.

(B) Waste Water Treatment

Industrial and sewage waste water Treatments: Primary secondary and tertiary treatment.

Biological Methods: Aerobic, anaerobic, trickling filter & activated sludge.

Unit III Air Pollution Due to Industries.

Classification of Air Pollutants - Primary and Secondary pollutants e.g. oxides of carbon, sulfur, nitrogen, hydro carbon and particulates.

Industries as source of air Pollution - Steel industries, Fertilizer industries, Thermal power plants, refineries, paper and pulp industries, metallurgical and mining operations.

Methods of control of Air Pollution - Electrostatic precipitators, scrubbing, filters mist eliminator.

Harmful effects of air pollutants on human being, plants and materials. Green House effect (global warming).

Air Pollution Monitoring - Methods of collection of air samples, SPM and determination of air pollutants like SO2, NOx and solid particulate matter (SPM).

Case Studies - Air pollution due to thermal power plants and Paper Industry.

Source of noise pollution, units of noise level and control.

Unit IV Industrial Solid Waste & Treatment Processes.

(A) Introduction, types of Industrial solid wastes, methods of Industrial solid waste treatment & disposal.

(i) Composting.

(ii) Sanitary Land-fills.

(iii) Thermal Process (Inclineration & Pyrolysis)

(iv) Recycling & reure.

(B) Hazards Waste.

Types, radioactive waste, biomedical waste and non-radioactive wastes. Containing toxic & heavy metals. Methods of their disposal.

Unit V Process Equipments.

(A) Thermometer - Glass, bimetallic, pressure spring, resistance & radiation pyrometer.

(B) Pressure - Manometer, barometer, pressure gauge,
diphargm, Macleon & Pirani gauges.
(C) Liquid Level - Direct & indirect liquid level measurements, float type liquid level gauge, ultrasonic level gauge. (Construction & working)

Practicals
Section - I

Unit Process - Synthesis of organic compounds involving the following processes.

Nitration, sulphonation, esterification, hydrolysis, reduction, halogenation, reduction, polymerisation reactions of diazonium salt.

Section - II

1. To determine temporary & permanent hardness of water sample.
2. To determine TDS (Total dissolved solid) & acidity/alkalinity of water sample.
3. To find DO of given sample of water.
4. To find BOD of given sample of water.
5. To find COD of given sample of water.
6. To determine Ca in cement by complexometric titration.
7. To determine SiO2 in cement by Gravimetric method.
8. Determination of Zn in brass by EDTA titration.
9. Determination of Al in Al alloy by Al-oxinate gravimetric method.
10. Determination of Fe / Cr in stainless steel.
11. Determination of SPM in air sample using high volume sampler.
12. Determination of SO2 in air sample by colorimetry.

LIST OF BOOKS
1. Environmental Chemistry by S.S. Dara, S.Chand & Camp.
2. Environmental Chemistry by A.K.De.
3. Environmental Chemistry by Tagi & Mehra.
4. Environmental Chemistry by Moor & Moor.
5. Industrial Chemistry by B.K.Sharma.
6. Pollution Monitoring and control by Editor - in - Chief : Dr.Priya Ranjan Trivedi.
9. Unit process in organic synthesis by Groggins.
10. Environmental Protection and Law (Manual)
17. Industrial Instruments D.P.Eckman, Jon-Wiley & Sons.

II. PETROCHEMICAL SCIENCE

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 - III

Petrochemical Science - I

Unit I Thermal & catalytic processes : Introduction; Thermodynamics of thermal stability of hydrocarbons with reference to the elements; Thermal cracking, visbreaking, pyrolysis, and coking : Relative study
with reference to feedstocks, products, operating conditions.

**Unit II**
Thermal and catalytic cracking: mechanism, feedstocks, catalyst details, operating parameters and their effects; product pattern, catalyst deactivation and regeneration.

**Unit III**
Recovery of ethylene from cracked gases, properties of ethylene, its storage, safety aspects; various petrochemicals obtained from ethylene through different unit processes and polymer products (no details of manufacturing processes).

**Unit IV**
Vinyl chloride monomer by direct chlorination of ethane, oxychlorination of ethylene and balanced route; Acetaldehyde by oxidation of ethyl alcohol, (Wacker process), Union Carbide process from ethylene, Lummus Process from ethane; Vinyl Acetate monomer from acetylene and ethylene, role of pdcl an CuCl₂ and Celanese Process.

**Unit V**
Manufacture, properties and uses of oxide derivatives like ethylene oxide, ethylene glycols, ethanol and ethanol amines. Ethylene oxide by direct oxidation and chlorohydrin process; Ethylene oxide hydrolysis; catalytic and non-catalytic, role of excess water and dilute sulphuric acid. Ethanol amine manufactures, properties and uses.

**PAPER-IV**
**Petrochemical Science-II**

**Unit I**
Recovery of propane and propylene from refinery and cracked gases, their properties, storage and safety; Manufacture of propylene from ethylene; Relative yields of ethylene and propylene from different sources, Important derivatives of propylene based on unit processes.

**Unit II**
Isopropyl alcohol by direct and catalytic hydration, details of Texaco process; Acetone from isopropyl alcohol, side reactions; propylene oxide through chlorohydrin process, disadvantages and side reactions in direct of oxidation.

**Unit III**
Oligomerization of propylene to trimer and tetramer, importance for detergents, polymer gasoline, alkylation; catalysts used and details of Dimersol-processes.

**Unit IV**
Butanol manufacture through oxo-processes by conventional and new process, their relative comparison based on feed, operating parameters catalysts etc; Relative studies of ethylene and propylene as petrochemical feed stocks, manufacture of linear alkene and linear primary alcohols.

**Unit V**
Acrylic acid: By carbonylation of acetone, air oxidation of propylene, chlorohydrin route and extension of Wacker process for its manufacture, details of catalyst and operating conditions; Details of production of Esters of acrylic acids, acrylamide Acrolein manufacture with respect to chemistry, catalyst, optimum conditions, product pattern, chemistry, catalyst, process details.

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

**BOOKS RECOMMENDED - B.Sc.Part-II:**

**PRACTICAL**
1. ASTM Distillation of petroleum product.
2. Viscosity determination & Viscosity Index determination.
3. Oil in wax determination in given wax sample.
4. Water determination in given oil sample.
5. Reid vapour pressure of volatile petroleum sample.
6. Ductility of bitumenous product.
7. Penetration Index of petroleum products.
8. Copper corrosion test for petroleum product.
9. Melting point determination of wax sample by various methods.
10. Congelation point determination of wax sample.
11. Determination of crankcase oil dilution.
12. Viscosity by Redwood method.

**BOOKS RECOMMENDED -**
1. Institute of Petroleum Handbook Volume I.
2. Institute of Petroleum Handbook Volume II.
### 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 Required</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 visometers of different capillary size</td>
<td>02 sets</td>
</tr>
<tr>
<td>10.</td>
<td>Thermometer (0 to 110°C IP Grade)</td>
<td>10 No.</td>
</tr>
<tr>
<td>11.</td>
<td>Thermometer (0 to 360°C 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>Porcelain 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 No. 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>
<tr>
<td>32.</td>
<td>Karl Fisher Autotitrator</td>
<td>1 No.</td>
</tr>
<tr>
<td>33.</td>
<td>Dean and Stark apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>34.</td>
<td>Flame Photometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>35.</td>
<td>Colorimeter</td>
<td>1 No.</td>
</tr>
<tr>
<td>36.</td>
<td>Bomb Calorimeter</td>
<td>1 No.</td>
</tr>
<tr>
<td>37.</td>
<td>Spectrophotometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>38.</td>
<td>Oxygen Cylinder with pressure regulating valve</td>
<td>1 No</td>
</tr>
<tr>
<td>39.</td>
<td>Vacuum pump</td>
<td>1 No.</td>
</tr>
<tr>
<td>40.</td>
<td>Air source</td>
<td>1 No.</td>
</tr>
<tr>
<td>41.</td>
<td>Air flowmeter</td>
<td>1 No.</td>
</tr>
<tr>
<td>42.</td>
<td>Desiccators</td>
<td>6 Nos.</td>
</tr>
<tr>
<td>43.</td>
<td>Water Suction</td>
<td>4 Nos.</td>
</tr>
<tr>
<td>44.</td>
<td>Filtration Flask with buckner funnels</td>
<td>100ml 6 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250ml 6 Nos.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500ml 3 Nos.</td>
</tr>
<tr>
<td>45.</td>
<td>Heating Mental</td>
<td>6 Nos.</td>
</tr>
<tr>
<td>46.</td>
<td>ASTM Distillation Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>47.</td>
<td>Viscometer and Constant temperature bath</td>
<td>1 set of viscometer</td>
</tr>
<tr>
<td>48.</td>
<td>Apparatus for oil determination in given sample As per IP norm</td>
<td>1 No.</td>
</tr>
<tr>
<td>49.</td>
<td>Reid vapour pressure apparatus with const. temp. bath</td>
<td>1 No.</td>
</tr>
<tr>
<td>50.</td>
<td>Ductility measuring meter</td>
<td>1 No.</td>
</tr>
<tr>
<td>51.</td>
<td>Penetrometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>52.</td>
<td>Copper corrosion test apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>53.</td>
<td>Cooling curve apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>54.</td>
<td>Crankcase oil ditution apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>55.</td>
<td>Thermometer as per IP norm</td>
<td>2 Each</td>
</tr>
<tr>
<td>56.</td>
<td>for above apparatus and methods</td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>Redwood viscometer No.I &amp; No.II</td>
<td>1 No. each</td>
</tr>
</tbody>
</table>

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

***
12. PHYSICS
(Implemented from the Session 2004-2005)

The Examination in Physics will comprise of THREE theory papers and a practical examination. Each theory paper will be of THREE hours duration and carries 40 marks. The practical Examination will be of six hours duration and carries 30 marks. The distribution of marks for practical examination is as follows:

<table>
<thead>
<tr>
<th>Experiment (Two Experiments)</th>
<th>18 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Nine marks for each Experiment)</td>
<td></td>
</tr>
<tr>
<td>Sessional Record Book</td>
<td>06 Marks</td>
</tr>
<tr>
<td>Viva-Voce</td>
<td>06 Marks</td>
</tr>
</tbody>
</table>

Total : 30 Marks

Paper-IV
(Oscillations, Motion of charged particles, Electric currents)


UNIT-II : Oscillations-II: - Superposition of two simple harmonic motion of the same frequencies along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequencies, Lissajous figures. Two coupled oscillators, normal modes, $N$ coupled oscillators, damped harmonic oscillations, forced harmonic oscillations, transient and steady states, power absorption, resonance in a system.

UNIT-III : Motion of Charged Particles in Electric and Magnetic fields:
(Note: The emphasis should be on Mechanical aspects, and not on the details of the apparatus mentioned which indicated as applications of principles involved.)

\( \text{As an accelerating field:} \) electron gun, case of discharge tube, linear accelerator (linac).

\( \text{As a deflecting field:} \) CRO, sensitivity.

\( \text{Transverse magnetic field:} \) Mass spectograph, velocity selector, curvatures of tracks for energy determination of nuclear particles. Principle of cyclotron. Mutually perpendicular $\mathbf{Q}$ and $\mathbf{B}$ fields: velocity selector, its resolution.

UNIT-IV : Varying Currents: - Steady currents, current density $J$, non steady current and continuity equation, Kirchhoff’s laws and analysis of multiloop circuits. Rise and decay of currents in LR, CR circuits, transient in LCR circuit.


Reference Books:
1) Oscillations waves, D.P.Khandelwal (Himalaya Publishing House, Bombay)
4) Mechanics, D.S.Mathur.
5) Electricity and Magnetism, D.N.Vasudeva.
6) Electricity and Magnetism, Brijlal and Subramaniam.

Paper-V
(Quantum Mechanics and Solid State Physics)

UNIT-I : Origin of Quantum Theory: - Failure of Classical Physics to explain phenomenon such as black body spectrum; photoelectric effect. Planck's hypothesis; Einstein's explanation of photo electric effect. Bohr's quantization of angular momentum and its application to hydrogen atom, limitations of Bohr's theory, wave particle duality; de-Broglie hypothesis of matter waves, wave velocity & Group velocity; evidence for diffraction of electrons & neutrons. Davisson & Germer's experiment.

UNIT-II : Consequence of De-Broglie Wave Concept: - Bohr's quantum conditions, wave packets; Heisenberg's uncertainty relation for momentum & position; extension to energy & time.
Consequence of Uncertainty relations: Gamma Ray microscope; diffraction at a slit; Non-existence of electron in the nucleus.

Postulatory Basis of Quantum Mechanics: Schrödinger equations for a free particle; Physical significance of wave function; Normalization of wave function.


Applications of Schrödinger equation to a particle in one & three dimensional boxes; Harmonic Oscillator; Hydrogen atom (only radial part).

UNIT-IV: Crystal Structure: Periodicity; Space lattices & bases; fundamental translation vectors; unit cell; Bravais lattices; Wigner-Seitz cell; allowed rotations; lattice planes; Miller Indices; Co-ordination numbers; determination of lattice parameter using Avagadro's number & density. Diffraction of X-rays; Bragg's Law.

Magnetism: Atomic magnetic moment, magnetic susceptibility, Diamagnetism, Paramagnetism and Ferromagnetism (Concept only).

UNIT-V: Thermal Properties: Lattice Vibrations; Simple harmonic oscillator; vibrations of one dimensional mono-atomic chain under harmonic & nearest neighbour interaction approximation; concept of phonons, density of modes (1-D); Debye model, lattice specific heat; low temperature limit.

Band Structure: Electron in periodic potential; nearly free electron model (qualitative); energy bands, energy gap; metals, insulators & semiconductors.

Motion of electron: Free electrons; conduction electrons, electron collision; mean free path, conductivity & Ohm's law; density of states; Fermi energy; Fermi velocity.

Reference Books:
1. Quantum physics of atoms, molecules, solids, nuclei and particles - Eisenberg & Resnik (John Wiley)
3. Quantum Mechanics - S.L.Gupta, V.Kumar, H.V.Sharma, R.C.Sharma.
UNIT-IV : Magneto statically :  Force on moving charge, Lorentz force equation and definition of B, force on a straight conductor carrying current in uniform magnetic field, magnetic dipole moment, Angular momentum and Gyromagnetic ratio.
  Biot - Savart's law, Ampere's law and its applications, field due to magnetic dipole, magnetisation current, magnetisation vector, magnetic permeability (linear cases).

UNIT-V : Time Varying field and Electromagnetic waves :
  Wave equations satisfied by E and B, Plane electromagnetic wave in vacuum, Energy density, Poynting vector, Poynting Theorem.

Reference Books :
1) Electricity and Magnetism Vol-II, Berkley Physics Course - Ed. E.M.Purcell (McGraw Hill)
2) Physics Vol-2, Resnik & Halliday.
3) Introduction to Electrodynamics - D.J.Griffits (PHI)
4) Electricity and Magnetism - Reitz & Millford (Addison Wesley)
5) Electricity and Magnetism - A.S.Mahajan & A.A.Rangwala (TMH)
6) Electromagnetic Fields- A.M.Portis
7) Principles of Electricity and Magnetism - Pugh & Pugh Addison Wesley)
8) Classical Electricity and Magnetism - Panofsky & Phillips (India Book House)
9) Electricity and Magnetism - S.S.Atwood (Dover)
10) Electromagnetics - B.B.Laud
11) Electrodynamics - S.L.Gupta, V.Kumar, S.P.Singh (Pragati Prakashan)

List of Experiments : (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 expts.)
1) Temperature of flame by reversal of spectral lines.
2) Determination of temperature coefficient of resistance of platinum using platinum resistance thermometer.
3) Variation of thermo e.m.f. with temperature.
4) Activation energy of thermister.
5) Study of statistical distribution on nuclear disintegration data (GM counter used as black box)
6) Characteristics of microphone and loud speaker system.
7) Speed of waves on stretched strings.
8) Measurement of velocity of ultrasonic waves.
9) To show that frequency of Helmholtz resonator varies inversely with square root of air coloumn.
10) Determination of charge sensitivity of ballistic galvanometer.
11) Measurement of low resistance by Carry-foster bridge.
12) Measurement of low resistance by potentiometer.
13) Measurement of inductance by phaser diagram method.
14) Measurement of capacitance by phaser diagram method.
15) Study of frequency resonance of series LCR circuit and determination of Q-factor.
16) Determination of dielectric constant of solid.
17) Determination of dielectric constant of liquid and its variation with temperature.
18) To study behaviour of R.C.circuit as a filter.
19) To determine high resistance by universal shunt.
20) To determine high resistance by leakage method.
21) C_1 / C_2 by De-Sauty's method.
22) Varification of laws of capacitacntes.
23) Capacitance by Scherring bridge.
24) Self inductance by bridge rectifier method.
26) Surface tension of liquid by vibration method.
27) Frequency of a.c. mains by sonometer.
28) Frequency of UHF / VHF oscillator.
29) Dispersive power of prism.
30) Characteristics of a phototransister.
31) Study of LVDT.
32) Varification of Kirchoff's law, using electrical network.
33) Varification of Maximum power transfer theorem.
34) Varification of Thevenin's theorem.
35) Varification of Norton's theorem.
36) Varification of Millman's theorem.
37) Varification of Star-Delta transformation.
38) Elementary Fortran Programes, flow charts and their interpretations.
39) To print out all natural even/odd numbers.
40) To evaluate sum of finite series using Fortran Programes.
41) To find "N" elements of Fibonacci series.
42) To find out roots of quadratic equation by Fortran program.

### List of equipment/Apparatus required for physics practical.

<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>Bipraism</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 Horizontal</td>
<td>4</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>Leclanché'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>
<td>1</td>
</tr>
<tr>
<td>32.</td>
<td>Standard resistance - 1</td>
<td>2</td>
</tr>
<tr>
<td>33.</td>
<td>Charge - discharge dy for absolute capacity</td>
<td>1</td>
</tr>
<tr>
<td>34.</td>
<td>Inductances</td>
<td>0.1 H</td>
</tr>
<tr>
<td></td>
<td>5 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>
<td>5</td>
</tr>
<tr>
<td>39.</td>
<td>C.R.O.</td>
<td>1</td>
</tr>
<tr>
<td>40.</td>
<td>Dinerstate</td>
<td>1</td>
</tr>
<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>
<td>1</td>
</tr>
<tr>
<td>52.</td>
<td>Ring disc (Dynamics) apparatus</td>
<td>1</td>
</tr>
<tr>
<td>53.</td>
<td>Poissulie's flow apparatus complete</td>
<td>1</td>
</tr>
<tr>
<td>54.</td>
<td>Thermometers 0 - 1100</td>
<td>5</td>
</tr>
<tr>
<td>55.</td>
<td>Steam traps (glass)</td>
<td>4</td>
</tr>
<tr>
<td>56.</td>
<td>Stands</td>
<td>5</td>
</tr>
<tr>
<td>57.</td>
<td>Weight boxes</td>
<td>6</td>
</tr>
<tr>
<td>58.</td>
<td>Helmholtz resonator</td>
<td>1</td>
</tr>
<tr>
<td>59.</td>
<td>Tuning forks set</td>
<td>1</td>
</tr>
<tr>
<td>60.</td>
<td>Frequency of A.C. mains apparatus</td>
<td>1</td>
</tr>
<tr>
<td>61.</td>
<td>Measuring cylinders 200 ml.</td>
<td>2</td>
</tr>
<tr>
<td>62.</td>
<td>Thomon's tube for e/m</td>
<td>1</td>
</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>
<td>1</td>
</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>
</tbody>
</table>
70. Study board of “Characteristics of Phototransistor”
71. Study board of NOR gates and switching characteristics
72. Study board of NAND gate and switching characteristics
73. Study board of Sequential logic FF
74. Study board of Sequential logic RS FF
75. Study board of Sequential logic C RSFF
76. Study board of Sequential logic J K FF
77. Study board of Op-Amp as differentiator
78. Study board of Op-Amp as an integrator
79. Study board of Op-Amp as an inverting amplifiers
80. Study board Op-Amp as an Non-inverting amplifiers.
81. Study of monostable multivibrator
82. Study of bistal multivibrator
83. Study of Astable multivibrator
84. Study of MOPA
85. Study of VHF oscillator
86. Study of diode detector
87. Study of amplitude modulator
88. Study of TRF receiver
89. Study of super herrodyne receiver
90. Digital power supply (Dual type)+15 to-15
91. P-N-diode
92. Apparatus of I-H curve
93. Study board for diode as rectifier
94. Study board for Thevinin's theorem
95. Study board for Millman's theorem
96. Study of Activation energy of thermister
97. Study board owen's bridge
98. Study board for maximum power transfer theorem
99. 'Y' by bending apparatus
100. Thermal conductivity of rubber tube cyparatus
101. 'n' by stastical method apparatus
102. Keler's Pendulum

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13. Chemistry

(Effective from the Session 2004-2005)

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

There shall be three compulsory papers in theory as stated below and practical examination extending for 8 hours. Every examinee shall offer the following three papers of 40 marks each and practical examination of 30 marks.

1) Paper-IV: Inorganic Chemistry 40 Marks
2) Paper-V: Organic Chemistry 40 Marks
3) Paper-VI: 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) 08 Marks
b) Organic Chemistry (Exercise) 08 Marks
c) Physical Chemistry (Exercise) 08 Marks
d) Record 03 Marks
e) Viva 03 Marks

Total: 30 Marks
Total Lectures : 60  
(Marks : 40)

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

UNIT I  
A] Covalent Bonding : [8]
Directional nature of covalent bond. Different types of hybridization schemes to explain geometrical shapes of molecules and ions namely BeF$_2$, BF$_3$, NH$_4^+$, CH$_4$, PCl$_5$, SF$_6$, and IF$_7$. Limitations of valence bond theory, Molecular orbital theory. Postulates of MO theory. LCAO approximation. Formation of bonding and antibonding MOs. Rules for LCAO. Homonuclear diatomic molecules - Structure of H$_2$, N$_2$ and O$_2$. Paramagnetic nature of O$_2$. Stability sequence in O$_2$ species namely O$_2^+$, O$_2^{2+}$, O$_2$, O$_2^-$, O$_2^{2-}$. Relation of stability with bond order. Heteronuclear diatomic molecules - Structure of NO and Coulson's structure of CO. Explanation of properties of CO (namely triple bond, low dipole moment, electron donor and acceptor behaviour) on the basis of MO structure. Band theory to explain nature of conductor, insulator and semiconductor. Comparison of VB theory and MO theory.

B] VSEPR Theory : [4]
Various rules under VSEPR theory to explain molecular geometry. Following examples to be used for explaining different rules : BeCl$_2$, BF$_3$, CH$_4$, PCl$_5$, SF$_6$, IF$_7$, NH$_4^+$, SnCl$_2$, NH$_3$, H$_2$O, SF$_5$, CIF$_3$, ICl$_2$, ICl$_4^-$, BrF$_5$, XeF$_6$, SOF$_5$, CoF$_5$, PCl$_3$, PBr$_3$, PI$_3$, F$_2$O, H$_2$S.

UNIT II  
A] Chemistry of Elements of Transition Series : [12]
Characteristic properties of d-block elements. Comparative study of first transition series (3d) elements with respect to electronic configuration, size, ionization energy, metallic nature, oxidation states, magnetic properties, colour of salts, catalytic properties, complex formation behaviour. Introduction to 4d and 5d series and their comparison with '3d' elements with respect to ionic radii, oxidation states, magnetic properties and colour.

UNIT III  
A] Lanthanides : [8]
Comparative study of lanthanide elements with respect to electronic configuration, atomic and ionic radii, lanthanide contraction - its cause and effect on lanthanides as well as post lanthanide elements, oxidation states, magnetic properties, colour of salts, complex formation behaviour. Occurrence and isolation of lanthanides by chromatography, solvent extraction and ion exchange methods (only underlying principles expected in all the methods).

Comparative study with reference to electronic configuration, Oxidation states. Chemistry of separation of Np, Pu and Am from Uranium. Comparison of Lanthanides and actinides.

UNIT IV  
A] Oxidation and Reduction : [6]
Redox potential, analysis of redox cycle. Latimer diagrams for system : ClO$_4^-$ to Cl$^-$, FeO$_4^{2-}$ to Fe, Cu$^{2+}$ to Cu and O$_2$ to H$_2$O.

Principles involved in extraction of elements - Factors influencing the choice of extraction process. Thermodynamics of reduction processes - Ellingham diagram for oxides and its importance. General principles of metallurgy - Ore dressing (concentration), calcination, roasting, smelting, refining of metals.

UNIT V  
1) Important Terms :
Primary standard, requirement of primary standards, standard solution, molarity, molality, normality, mole fraction. (problems not expected)
2) Acid-base titration :
Concept of variation of pH during titration. Acid-base indicators. Choice of suitable indicators on the basis of indicator range and pH near equivalence point for different acid base titrations.
3) Redox Titrations :
General principles (namely redox reaction between oxidant and reductant), indicators used in redox titrations. Brief idea about use of KMnO$_4$, K$_2$Cr$_2$O$_7$ as oxidizing agents (in acidic medium) in redox titrations. Use of iodine in iodometric and iodimetric titrations involving use of starch as indicator.
UNIT IV
A) Aromatic Nitro Compounds:
Introduction, methods of synthesis (Nitration and different nitrating agents). Reduction of aromatic nitro compounds under different conditions, applications.

B) Amino Compounds:

UNIT V
CARBOHYDRATES, AMINO ACID PEPTIDES, PROTEINS AND NUCLEIC ACID.
A) CARBOHYDRATES

B) Amino acids and Proteins:
Classification of amino acids, Methods of synthesis and reaction on 2 amino acids, zwitterion structure. Isoelectric point, peptide synthesis, structure determination of polypeptides by end group analysis.

C) Nucleic acid:
Nucleic acid, introduction, constituents of nucleic acid. Ribonucleotides, Ribonucleosides. Double helice structure of DNA.

UNIT VI
(Physical Chemistry)
Total Lectures : 60  Marks : 40
UNIT
THERMODYNAMICS-I
statements of the law. Carnot's cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, physical significance of entropy, entropy as function of V and T, entropy as a function of P and T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Numerical problems.

UNIT II
THERMODYNAMIC AND CHEMICAL EQUILIBRIUM [12]

UNIT III
PHASE EQUILIBRIUM [12]

UNIT IV
ELECTROCHEMISTRY [12]

UNIT V
SOLUTIONS, DILUTE SOLUTIONS AND COLLIGATIVE PROPERTIES [12]

Practical
A] Inorganic Chemistry Practicals:
Calibration of fractional weights, pipettes and burettes.
i) Gravimetric Estimations:
Gravimetric estimations of Ba^{2+}, Fe^{3+}, Zn^{2+}, Cu^{2+} as CuSCN and Ni^{2+} as Ni^{2+}-DMG. At least three estimations to be performed by the student. Electronic balance or calibrated fractional weight boxes may be used (At least one estimation to be done by using calibrated fractional weight box).

B] Organic Chemistry Practicals:
Complete analysis of a simple organic compound containing one or two functional groups and involving following steps:
1) Preliminary examination.
2) Detection of the elements.
3) Detection of the functional groups.
4) Determination of m.p./b.p.
5) Preparation of derivative and its m.p./b.p.
6) Performance of spot test if any.
Minimum 12 to 15 compounds containing different groups should be identified by student.
C] Physical Chemistry Practicals:
1) To study distribution of benzoic acid between water and benzene.
   Determination of molecular state of benzoic acid.
2) To determine partition coefficient of iodine between water and
   organic solvent.
3) To determine the transition temperature of the given substance by
   thermometric method (e.g. MnCl₂·4H₂O or SrBr₂·2H₂O)
4) To draw the solubility curve of phenol-water system.
5) To determine molar mass of a non-volatile substance by Rast method.
6) To determine the solubility of benzoic acid at different temperature
   and to determine $H$ of the dissolution process.
7) To determine the enthalpy of solution of solid calcium chloride and
   calculate the lattice energy of calcium chloride from its enthalpy
data using Born Haber cycle.

BOOKS RECOMMENDED for paper-III Inorganic Chemistry.
1. Principle of Inorganic Chemistry-by-Puri,Sharma and Kalia- S. Naginchand
   & Co.Delhi.
3. Selected Topics in Inorganic Chemistry by Malik,Tuli and Madan S. Chand
   & Co.
5. Instrumental Methods of Analysis by Chatwal & Anand,Himalaya
   Publishing House.
6. Concise Inorganic Chemistry by J.D. Lee - Elbs.
8. Fundamental Concepts of Inorganic Chemistry by E.S. Gilreath, McGraw
   Hill Book Co.
10. Chemistry Facts, Patterns & Principle by Kneen, Rogers & Simpson
    Elbs.
    Hill.
12. Inorganic Complex Compound by Murmann-Chapman & Hall.
    House,Delhi

BOOKS RECOMMENDED for paper-IV (Organic Chemistry)
5. Reaction Mechanism in Organic Compounds by S.M. Mukherjee and
   S.P.Singh.
6. Spectroscopy & Mechanism Chemistry by P.S. Kalsi
7. Stereochemistry & Mechanism through solved problems by P.S. Kalsi
10. Text Book of Practical Organic Chemistry by A.L.Vogal
11. Text Book of Organic Chemistry by Wadodkar, Raut, Dighade, Thakre,
    Kale, Kadu, Chincholkar.
    India 1999, Delhi.
14. Comprehensive practical Organic Chemistry (Qualitative Analysis) by
    V.K.Ahuwalia, Sunita Dhingra, Orient Longman.
15. Comprehensive Practical Organic Chemistry (Preparation and Qualitative
    Analysis) by V.K.Ahuwalia, Renu Agrawal, Orient Longman.
16. Text Book of Organic Chemistry : Deshmukh, Awinashe, Tayade, Wadekar,
    Meshram, Parhate, Bokey Prakashan, Amravati.

BOOKS RECOMMENDED for paper-V (Physical Chemistry)
1. Physical Chemistry : Walter J.Moore,5th Edn,New Delhi
8. Practical Physical Chemistry : Palit and De.
9. Practical Physical Chemistry : Yadao
10. Practical Physical Chemistry : Khosla
11. Laboratory Manual of Physical Chemistry : W.J. Popiel
12. Practical Chemistry : Dr.S.B. Lohiya, Bajaj Publ Amt.
13. Text Book of Physical Chemistry by : Doshi, Rane, Mandakmare, Kulkarni, Wagh and Mahajan

Additional Books suggested for (Theory Courses).
2) Concise Inorganic Chemistry, J.D. Lee, ELBS.
6) Inorganic Chemistry, A.G. Sharpe, ELBS.
16) Computer Science Common Sense, R. Hant and Shelly, Prentice Hall.
17) University General Chemistry, C.N.R. Rao, Macmillan.

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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
9. Density bottle 20 nos/batch
10. Kipp's apparatus 02 nos/batch
11. Quick fit distillation assembly/ Multipurpose assembly 10 nos/batch
12. Sintered glass crucible 20 nos/batch
13. Silica crucible 20 nos/batch
14. Vacuum suction pump 02 nos/Lab.
15. Potentiometer 02 nos/batch
16. Metzler electronic one pan balance 01 nos/Lab.
17. Filtration flasks with buckner funnels, 100 ML 10 nos/batch
200 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. Chromatographics jar 05 nos/batch
25. Separating funnels 250ml, 500ml 05 nos/batch
26. Hot Air Ovan 02 no/lab
27. Hot Cold Air Blower 01 no/lab
28. Centrifuge Machine (Electrically operated) 02 no/lab
29. Deioniser/Water still 01 no/lab
   (Electrically operated)
30. Hot plate/Heating mantle 05 no/batch
31. Models of Element (Seven Cryst.types
    And their symmetry) 01 no/batch
32. Flame Photometer 02 nos/batch
33. Spectrophotometer 02 nos/batch
34. Shaking Machine 01 no/batch
35. Polarimeter 02 nos/batch

* * *

14. BOTANY
(Implemented from the session 2004-05)

The syllabus is based on the 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 forty (40) marks. The annual practical shall be of four hours duration and
carry thirty (30) marks.

PAPER-IV

DIVERSITY AND REPRODUCTION IN SEED PLANTS

UNIT-I : Seed Plants :
(1) Characteristics of seed plants.
(2) Evolution of seed habit (Gymnosperms and Angiosperms)
(3) Geological time scale.
(4) General features of Gymnosperms and their classification.
(5) Palaeobotany - a) Process of fossilization and types of
   fossils.
   b) Fossil Gymnosperms : Calymatotheca hoeninghausii.

UNIT-II : Gymnosperms :
Morphology of vegetative and reproductive parts, anatomy
of root, stem and leaf; Reproduction and life cycle of a) Pinus,
b) Gnetum.

UNIT-III : Angiosperms :
Flower : A modified shoot, structure, types and functions of
different parts of flower, Types of placentation and
inflorescences.
Types of pollination; attractions and rewards for pollinators;
pollen-pistil interaction.

UNIT-IV : Angiosperms :
Microsporangium, microsporogenesis, development of male
gametophyte, Megasporangium, types of ovules,
Megasporogenesis; development of female gametophyte
(monosporic); double fertilization and triple fusion.

UNIT-V : Angiosperms :
Formation of seed :- Endosperm, its types, development of
embryo in Capsella bursa-pastoris.
Significance of seed :- Suspended animation, ecological
adaptations, unit of genetic recombination and replenishment,
dispersal strategies.
Fruits : Morphological types.

PAPER-V

STRUCTURE AND DEVELOPMENT IN FLOWERING PLANTS

UNIT-I : Morphology :
a) The basic body plan of a flowering plant - root, stem
   and leaves.
b) Diversity in plant habits - Annuals, biennials and
   perennials.
c) Root :- Tap and adventitious root.
   Modifications of roots for storage, respiration,
   reproduction and for interaction with microbes.

UNIT-II : Morphology :
a) Stem : Modifications of underground and aerial stem.
   Role of stem in vegetative propagation :
   Cuttings and grafting.
b) Leaf : Parts, simple and compound leaves, phyllotaxy,
   stipules and venation.

UNIT-III : Anatomy :
Types of tissues : i) Meristematic : Apical meristems in root
and stem, cambium and its functions. ii) Permanent :- Simple
 tissues and complex tissues.
General account of wood structure in relation to the
conduction of water, minerals with comments on sapwood,
heart wood and Role of woody skeleton in plant body,
characteristics of growth rings, Secondary Phloem - Structure,
Function, relationship; Periderm.
UNIT-IV : Anatomy:
   a) Root: Primary structure in Dicot root (Sunflower) and monocot root (Maize); Normal secondary growth in Dicot root.
   b) Stem: Histological and vascular organisation in primary structure of monocotyledons and dicotyledons stems.

UNIT-V : Anatomy:
   a) Normal secondary growth in Dicot stem.
   b) Anomalies in primary structure of Boerhaavia stem,
   c) Anomalies in secondary structure of Bignonia stem and Dracaena stem.
   d) Leaf: Internal structure in relation to photosynthesis, waterloss, adaptation to water stress in Nerium leaf and Maize leaf.

PAPER-VI
ANGIOSPERMS SYSTEMATICS

UNIT-I : Angiosperms :- Origin and evolution.
(Pteridospermean and Bennettitalean theory.)
Botanical Nomenclature : Principles and rules, Taxonomic ranks. Type concept; Principle of priority.

UNIT-II : Angiosperm Taxonomy :- Brief history; aims and fundamental components (alpha - taxanomy; omega taxanomy; holotaxonomy); identification keys.
Taxonomic Literature : Floras; Monographs, Indian herbaria.
Indian Botanical Gardens at Kolkata; and Lucknow. Major contributions of cytology and Phytochemistry to taxonomic studies.

UNIT-III : Classification of Angiosperms : Bentham and Hooker's system, Engler and Prantl's system.
Families of Monocotyledons-Liliaceae, Poaceae.

UNIT-IV : Families of Dicotyledones : Annonaceae; Brassicaceae; Malvaceae; Rutaceae, Leguminosae; Apiaceae.

UNIT-V : Families of Dicotyledons : Asteraceae; Apocynaceae; Asclepiadaceae; Solanaceae; Verbenaceae; Lamiaceae; Euphorbiaceae.

Laboratory Exercises:
1] Study of Fossils: Compression, impression.
   a) Lyginopteris oldhamia

2] Study of Pinus and Gnetum.
   b) Gnetum : i) Habit and structure of whole male and female cones.

3] Embryology of Angiosperms :
   i) Observation of wide range of flowers available in locality and methods of their pollination.
   ii) Study through permanent slides of T.S. of anther, microsporogenesis, L.S. of ovule, Types of endosperms and embryo of Capsella.
   iii) Mounting of T.S. of anther, Pollengrains and Pollinia.


6] Taxonomy : Description of ten plants belonging to the different families in technical language and identification upto family level.

7] Long excursion and short excursions are essential.

NOTE: The students should not collect the plants from excursion sites and prepare field report for submission during practical examination.

Taxonomy: The following species are suitable for study. This list is only indicative. Teacher may select plants available in their locality.

1] Annonaceae : Anonna squamosa, Polyalthia longifolia
2] Brassicaceae : Brassica, Raphanus
5] Fabaceae (Leguminosae) :
   a) Faboideae (Papilionoideae) :- Cajanus, Tephrosia, Indigofera, Crotalaria, Clitoria.
   b) Caesalpinoideae : Caesalpinia, Cassia, Delonix.
   c) Mimosoideae : Prosopis, Acacia, Pithecellobium.
9] Solanaceae :  
Datura, Solanum, Withania.

10] Euphorbiaceae :  
Croton, Jatropha, Euphorbia.

11] Lamiaceae :  
Ocimum, Hyptis, Leucas.

12] Verbenaceae :  
Lantana, Verbena, Vitex.

Practical Examination

Time : 4 Hrs.  
Marks : 30

Q.1 Preparation of temporary mount of TS/TLS/RLS of given Gymnospermic material. Identify with reasons. ----(4)

Q.2 Preparation of double stained permanent micropreparation of given Angiospermic material.  
Identification with reasons. ---- (5)

Q.3 Description of the given Angiospermic plant in technical language, identification upto family, floral formula and floral diagram.  
---- (5)

Q.4 Comments on given Morphological specimens - A) Vegetative, B) Reproductive.  
---- (4)

---- (6)

Q.6 Class record, field report, submission of micropreparations, viva-voce. .  
---- (6)

Books Recommended :


19] Chandurkar : Plant Anatomy


LIFE AND DIVERSITY OF CHORDATA

Unit I
Phylum Chordata;
General characters and classification up to orders –
Origin of Chordata
Prochordates: General characters - Type study: Amphioxus
External Characters - Digestive system, Excretory organs, gonads-
Affinities of Amphioxus.
Agnatha: General characters and affinities –

Unit II
Pices: General characters,
Type study: Scoliodon (Dogfish) – External Characters
Digestive system: alimentary canal and digestive glands,
Respiratory system: respiratory organ and mechanism of
respiration, Circulatory system: Arterial, venous system, structure
and working of Heart, Lateral line receptors, Migration in fishes-
Types, causes and significance.

Unit III
Amphibia : General characters; Type Study – Frog, external
characters.
Circulatory system, Respiratory system - Structure of Heart,
Arterial system, Venous System,
Male and Female urinogenital system. Structure of Eye, Parental
Care in amphibia.

Unit IV
Reptilia: General characters
Type study- Calotes- External characters, circulatory system-
Structure of Heart, Arterial system, Venous system. Urinogenital
system. Poison apparatus in snake, venom and biting mechanism.
Types of Skulls in Reptilia

REFERENCE BOOKS:
Publication Meerut.
5. A Text Book of Chordates – A .Thangamani, S. Prasannakumuts,
L.M.Narayanan and
Publication Meerut.
New Delhi.
Publication, Meeru
10. Manual of Zoology Vol. II (Chordata), S. Viswanathan (Printers and
Delhi, 1151 pp.
- 144 008, 942.
Agra - 282 003, 477 pp.
A.Z.T,B.S. Publishers and Distributors, New Delhi - 110 051, 952 pp
**Paper V**

**ADVANCED GENETICS**

**UNIT I**

Introduction, scope and importance of genetics, Concept of gene and gene action.


Interactions of genes: Types of genetic interaction, Supplementary factor, complementary factor, duplicates factor, inhibitory factors, and lethal factors – dominant and recessive.

**UNIT II**

Linkage - Types of linkage, linkage group, arrangement of linked genes, and significance of linkage. Crossing over – Mitotic and meiotic crossing over, Mechanism of crossing over, theories of crossing over – Darlington’s theory, breakage and exchange theory, and copy choice theory. Types of crossing over – Single, double and multiple crossing over. Factors affecting crossing over, Significance of crossing over.

**UNIT III**


**UNIT IV**


**UNIT V**

Genetic Screening and parental diagnosis: Parental, Carrier, Predictive, CVS (Chorionic Villus Sampling), Amniocentesis, Gene probe and DNA analysis.

Genes in Human Heredity: Inheritance of eye color. Skin color. Recessive genes and consanguineous marriages.

Genetic counseling: Risk of marriages in affected family. Birth control measures (male and female).


**REFERENCE BOOKS:**


**Paper VI**

**Ecology and Evolution**

**UNIT I**

Ecology: concept and scope: Abiotic factors

Water: Properties, water problem in terrestrial and aquatic habitat.


Light: Spectral distribution, Biological effects of light on aquatic and terrestrial animals: Reproduction, Metamorphosis, pigmentation, vision, photokinetics, phototropism, photoperiodism, migration. Ecological effects on photosynthesis, Biotic factors:

Intra specific and interspecific associations, Predation, parasitism, Antagonism, commensalisms, mutualism, competition, Competitive principle or Gauze’s principle.

**UNIT II**

Ecosystem


**UNIT III**

Evolution: concept and scope, Indirect Evidences of evolution: Comparative- anatomical,
physiological and Biochemical, embryological, Geographical distribution.

**Direct evidences of evolution:** Paleontological evidences: Fossils and fossilization – Types of fossils, Radioactive carbon dating of fossils - Living fossils. Introduction to Geological eras -

**UNIT IV Evolutionary Processes**

Natural selection: Mechanism of Natural selection – resistance of insects to pesticides, antibiotic resistance in bacteria, -

Industrial melanism – Types of selection, Iso-lation: Types and mechanisms –


**UNIT V**

Evolution of horse.

Evolution of Man,

Mimicry & Coloration,

Aquatic, and desert Animal Adaptations:

Bioluminescence; Chemistry and significance

Indian Wild life and its management.

**REFERENCES BOOKS:**


**Practical.**

Two practical per week of 3 periods duration. Examination shall be Of 5 hrs duration and of 30 marks.

A) **Classification of the following animals (specimens or models) up to orders:**

**Protochordata:** Herdmania, Doliolum Salpa, Amphioxus.

**Agnatha:** Petromyzon, Myxine.

**Pisces:** Scoliodon, Torpedo, Acipenser, Exocoetus. Hippocampus

**Amphibia:** Ichthyophis, Salamander, Bufo, Hyla.

**Reptilia:** Varanus, Phrynosoma, Chameleon, Cobra, krait, Russell’s viper, Typhlops, Hydrophis

**Aves:** Duck, Woodpecker, Kingfisher, Parrot.

**Mammals:** Mongoose, Squirrel. Manis. Bat.

B) **Dissections:**

1. Dissection - afferent and efferent branchial vessels, cranial nerves, internal ear of scoliodon.
2. Dissection - Digestive system, Arterial system, Venous system, reproductive system of wild rat.
4. Observations of air bladder in air breathing fishes.

C) **Osteology.** Rabbit, varanus (excluding loose bones of skull).

D) **Genetical experiments:**

1. Recording of Mendelian traits in man.
2. Detection of monohybrid and dihybrid cross with the help of plastic beads.
3. Study of following human genetic traits and application of Hardy-Weinberg Principle to them – Baldness, length of index and ring finger, attached and Free earlobes, rolling of tongue, PTC taste. Other notable traits.
4. Demonstration of bar bodies.
5. Preparation of human Karyotypes from Xerox pictures (E).
6. Photo slides for, Turner’s syndrome, Klinefelter’s syndrome, Down’s syndrome
7. Detection of syndrome from chromosome spread picture.

E. Ecology and Evolution:
2. Adaptations of aquatic and terrestrial animals based on a study of museum specimens. Such as rocky, sandy, muddy shore animals, flying and burrowing animals.
3. Study of natural ecosystem and field report of the visit.
4. Study of fossils, including living fossils.

F. General :
1. Visit to a National park or sanctuary, Natural history museum, and submission of report.
2. Study of diversity of vertebrates from local area.

DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATION.
1. Dissection: - 05
2. Permanent stained micropreparation. - 03
3. Spotting. (specimens, Slides, bones, syndrome photo, fossil) - 08
3. Genetic experiment - 04
4. Ecology experiment - 04
4. Class record - 02
5. Viva – Voce - 06
6. Submission of study tour report. - 02

Total Marks: 30

PAPER – IV
ELECTRONIC DEVICES AND CIRCUITS

Unit I : Transistor amplifier:

Unit II : Power Amplifier:
Classification : Class A, Class B, Class C and Class AB amplifiers, Class A - transformer coupled amplifier, Class-B push-pull amplifier (Construction, working and efficiency of each). Crossover distortion, complementry symmetry Class-B push-pull amplifier. Principle construction & working of class C tuned amplifier (single & double tuned)

Unit III : Feedback Amplifier & Oscillator:
Concept of feedback, feedback theory, positive & negative feedback, Advantages of negative feedback, physical idea of types of feedback (block diagrams only). Concept of oscillators, barkhausen criteria of oscillations, RC oscillators, - phase shoft and Wein bridge, LC oscillators – Collpitts
Unit IV: Operational amplifiers:
Difference amplifier (Concept, construction and working), Block diagram of Op-Amp, Characteristics of ideal op-amp, parameters of op-amp, input impedance (Zi), output impedance (Zo), open loop gain, close loop gain, CMRR, Slew rate Input offset voltage & current, Input bias current.

Unit V: Application of Op-Amp:

PAPER – V
DIGITAL TECHNIQUES

Unit I: Multivibrators & Flip flops:
Construction & working of Astable, monostable and Bistable transistorised multivibrators, RS, CLK RS, D, JK, JKMS Flip Flops (Logic diagram, Truth table, construction & working), Concept of edge trigger Flip-Flop, Concept of preset & clear terminal.

Unit II: Counters:
Asynchronous & synchronous Counter, Up-down counters (up to 4-bits), modified asynchronous counter, Applications of counters, IC version of counters – 7493IC & 7490IC.

Unit III: Shift registers:
Types of shift registers, SISO, SIPO, PISO & PIPO shift registers (Construction & working), left shift-right shift registers, IC version of shift register – 7495, Application of shift register, Ring counter, Johnson’s counter.

Unit IV: Memory:
Concept of primary & secondary memory, memory hierarchy, classification of memories, Floppy disk, Winchester disk, CD, DVD, Semiconductor memories: RAM, ROM, PROM, EPROM, EAROM, EEPROM.

Unit V: A/D & D/A converters:
Need of A/D and D/A converters.
D/A converters: Weighted resistors, R-2R ladder type, Specifications, IC version DAC0808
A/D converters: Counter type, successive approximation type, Specifications, IC version ADC0808.

PAPER VI
MICROPROCESSOR

Unit I: Evolution of microprocessor, Microcomputer (block diagram with functions of each block), Architecture of INTEL 8085 microprocessor, Functions of each blocks of 8085, pin diagram and functions of all pins of 8085.

Unit II: Instructions and Timings of 8085:
Instruction format, Addressing modes, classification of instruction set of 8085 with examples, T-state, fetch & execute cycle, timings of fetch, execute cycle & machine cycle.

Stack & subroutine:
Concept of stack, stack pointer, stack related instructions (PUSH & POP), simple programs illustrations.
Concept of Subroutine: CALL & RET instruction, simple programs illustrations.

Unit III: Programming:
Algorithm, flowchart, assembly and machine language, its advantages & disadvantages, Assembly language programmes for addition, substraction, multiplication, division, finding maximum and minimum numbers.

Unit IV: Interfacing:
Basic interfacing concept, memory mapped and I/O mapped I/O schemes, data transfer scheduling, 8255 PPI: Block diagram, functions of each blocks, Pin diagram, functions of each Pins, operation modes of 8255, control word format in I/O & BSR mode, illustrative examples.

Unit V: Microprocessor Applications:
Delay subroutine (using one reg. & reg. pair), Seven segment LED display, Display of Alphanumeric characters, Measurement of electrical quantity (frequency & phase), measurement of Physical Quantity (temp. & strain).

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BOOKS RECOMMENDED:
1. Analog and Digital techniques by Navneeth, Kale, Gokhale (Kitab Mahal Prakashan)
2. Digital Principles and Applications by Malvino and Leech.
5. Digital Computers by Malvino (Mc Grow Hill Publication)
6. Electronic Devices and circuits by Millman and Halkias (Mc Graw Hill publication)
7. Elements of Electronics by M.K.Bagde and S.P.Singh (S.Chand and Company)
8. Basic Electronics by B.L.Theraja (S.Chand and Company)
9. Monograph on Electronic Design and Principle by Goyal and KHETAN (Khanna Publisher)

PRACTICALS
Every student is expected to perform at least eight experiments from each group.

SECTION A
1. Study of frequency response of single stage CE amplifier.
2. Study of phase shift oscillator and calculation of frequency.
3. Study of Wein Bridge oscillator and calculation of frequency.
4. Study of zener regulated power supply.
5. Study of series transistor regulator.
6. Study of RS,CKRS and DFF.
7. Study of JKFF.
8. Study of JKMSFF.
10. Study of up/down counter.
12. Study of ring counter.
13. Study of IC 7490 as decade counter.
14. Study of IC 7483 as 4 Bit binary adder.

SECTION B
1. To construct and verify the working of op Amp as inverting amplifier.
2. To construct and verify the working of op Amp as non inverting amplifier.
3. To construct and study the OP AMP as summing amplifier.
4. To construct and study the frequency response of RC coupled amplifier.
5. To construct and study the transistorised monostable multivibrator.
6. To construct and study the transistorised astable multivibrator.
7. To construct and study the transistorised bistable multivibrator.
8. To construct and study the modified asynchronous counter.
9. To construct and study the modified asynchronous counter.
10. To construct and study the UJT as relaxation oscillator.
11. To construct and study pushpull amplifier.
12. To construct and study high pass RC circuit.
13. To construct and study diode circuit as clipper.
15. Program for addition of two 8-bit numbers.
16. Program for subtraction of two 8-digit numbers.
17. Program for multiplication of two 8-digit numbers.
18. Program for Division of two 8-digit numbers.
19. Program for display of sequential Hexadecimal numbers.
20. Program for display of sequential serial numbers.
21. Any other innovative program or Assembly language program for 8085 microprocessor.

List of optimum apparatus required to perform the practicals for a batch

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Name of Apparatus</th>
<th>Minimum Nos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VTVM/FET VOM</td>
<td>05</td>
</tr>
<tr>
<td>2</td>
<td>CRO Single Trace</td>
<td>05</td>
</tr>
</tbody>
</table>
3. CRO DUAL TRACE 02
4. Function Generators 10
5. Frequency Counter 01
6. RF Generator 01
7. Digital Multimeter 05
8. Multimeters 15
9. AC Millivoltmeter 01
10. Voltmeters a) 0 - 1 V 02 
    b) 0 - 5 V 06 
    c) 0 - 10 V 10 
    d) 0 - 15 V 06 
    e) 0 - 30 V 02
11. Ammeters a) 0 - 100 mA 02 
    b) 0 - 250 mA 04 
    c) 0 - 500 mA 04 
    d) 0 - 1 mA 04 
    e) 0 - 5 mA 04 
    f) 0 - 10 mA 06 
    g) 0 - 20 mA 06 
    h) 0 - 50 mA 06 
    i) 0 - 100 mA 06 
    j) 0 - 250 mA 02 
    k) 0 - 500 mA 02 
    l) 0 - 1A 02
12. Stabilised D.C. Power Supply - 1A a) 0 - 9 V 05 
    b) 0 - 12 V 10 
    c) 0 - 30 V 03 
    d) 0 - 5 stabilised 07 for 78xx series. 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 Pump 08
18. Wire metal and paste  500 gm & 1 pack each.
19. Stop watch, Continuity Tester 03
20. Microprocessor kits 10
21. PC (Pentium-4 with Printer) 01
22. Microprocessor unit 8086 01
23. Experimental boards of each expt. as per syllabus 01 each.
24. All electrical & electronic tools each of each type.
25. bread boards 12
26. Patch chords & sockets as per req.
27. Wires, buttons, fuses & other materials as per.
28. Linear & digital IC tester boards each 01

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List of Loose Components

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Component</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Registers - 1W (Mixed)</td>
<td>SD (pieces of each)</td>
</tr>
<tr>
<td>2.</td>
<td>Capacitors - 30V (Mixed)</td>
<td>10 (pieces of each)</td>
</tr>
<tr>
<td>3.</td>
<td>Inductors (Mixed)</td>
<td>2 (pieces of each)</td>
</tr>
</tbody>
</table>
| 4.     | 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 |

* * *
5. Diodes 15 pieces of each.
6. UJT/SCR/Diac/Triac 05 pieces of each.
7. Potentiometers
   a) 0 - 500 05
   b) 0 - 1K 10
   c) 0 - 2K 10
   d) 0 - 5K 08
   e) 0 - 10K 05
8. Step down transformers 03 pieces each.
9. ICs 741/3085/555 each 05
    723/78XX/79XX
    74XX series
10. Other Miscellaneous as per components for designing requirements.

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**17. BIOLOGICAL TECHNIQUES AND SPECIMEN PREPARATION.**

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 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 collection of animal/plant specimens during first year which will be treated as a part of “on the 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.
glassware / specimens / living organisms / equipment / purchase and maintenance of living organisms including aquarium, terrarium, animal house, garden.

Unit-II: Abiotic pollutants of water and their indicators and assay techniques. Distribution of plants and animals-Methods of survey, determination of frequency dominace etc. Air pollution-determination of abiotic and biotic components.

Unit-III: Simple circuits - how to read a circuit diagram; parallel and series connections; fuses, plugs, wires for common electrical equipments; voltage stabilizers; safety in handling electrical equipments.

Unit-IV: Chromatographic techniques : theory, methods and application of paper chromatography; TLC, ion-exchange, gel-filteration and other types, fraction collector; gradient elution techniques. Electrophoresis-theory, methods and applications-paper and gel electrophoresis.

Unit-V: Tissue culture techniques and their application-Cellular components-identification, separation for in vivo & in vitro studies-applications. Immunological techniques-antigen-antibody, reactions; monoconal antibodies; blood grouping. Isolation and characterisation of molecules of the cell : sugars, proteins, amino acids, lipids, RNA, DNA.

**PRACTICAL COURSE**

1. Preparation of various grades of distilled water.
2. Cleaning of glass wares, microscope slides etc.
3. Use and maintenance of standard joint equipment.
4. Sterilization of glassware.
5. Glass blowing, cutting glass plates, tubes and rods, bending tubes, drawing capillary, sealing vials.
6. Use and care of balances.
7. Preparations of solutions, buffer as per theory.
8. Use and care of pH meter.
9. Acid base titration.
10. Preparation and maintenance of aquarium, terrarium.
11. Maintenance of living organisms, plants & animals.
13. Water analysis DO, CO₂, BOD, COD, pH, Salinity, Chorides, nitrates, phosphnates, fluorne, silicates, Alkalinity, hardness.
14. Analysis of heavy metals in soil and water -Hg, Cd, Pb.
15. Estimation of plant and animal population in aquatic and terrestrial ecosystem.
17. Study of air pollution.
18. Use and maintenance of colorimeter, spectrophotometer and flame photometer.
19. Simple circuits, soldering, changing plugs, wires, fuses, voltage stabilizers, rheostats.
20. Repair and maintenance of oven, incubator, electrical waterbath, shakers.
22. Paper chromatography (one & two dimensional)
23. Thin layer chromatography.
24. Electrophoresis, gel and paper techniques and maintenance of equipments.
25. Column chromatography including ion-exchange and gel filtration.
26. Plant and animal tissue culture techniques.
27. Separation of cellular components, use of sonicator and high speed centrifuge.
28. Enzyme action and factors affecting enzyme action.
29. Still reaction of isolated chloroplast.
30. Immunological techniques.
31. Isolation of proteins and DNA (as per theory).
32. Quantitative determination of glucose, proteins, amino acids, DNA, chlorophyll.
33. Tissue culture techniques.

**PRACTICAL EXAMINATION**


or

10. Preparation and maintenance of aquarium, terrarium.
Chromatography - Thin layer or paper 10 Marks

Q2. Water analysis, any one DO, CO2, alkalinity, hardness, pH, salinity, Chlorides, Phosphates, nitrates, or
Identification of Phytoplanktons/Zooplanktons 5 Marks

Q3. Soldering of wires or
Acid-base titration or
Glass blowing, cutting glass plates or
Enzyme action or
Identification of blood groups 5 Marks

Q4. Minor experiment on Electrophoresis or
Tissue Culture 5 Marks

Q5. Practical record & Viva-Voce 5 Marks

Total : 30 Marks

BOOKS RECOMMENDED for Paper-III and Paper-IV.
2. Principles of Biochemistry : Lehninger A.L., Warth Publisher N.Y.
8. Quantitative inorganic analysis : A.I.Vogel, ELBS publisher.
10. Introduction to plant tissue culture : Dey Dalyankumar, Central Book Agency, Calcutta.
15. Fundamentals of Biotechnology : Purohit S.S., Agro Biotechnical Publisher, Bikaner.

* * *

18. Instrumentation (Vocational)

Electronic Devices and Circuits

Unit I
Semiconductor Physics of Diodes, Characteristics of diodes, Rectifying circuits and dc power supplies, Filter circuits for power supplies, The diode clamper and voltage doublers, Zener diode Tunnel diode and Thermistors.
Scope: Electronic Devices and Circuits, Allen Mottershed, PHI, 18th Printing 1996
Chapters: 5,1,2,3,4,6

Unit II
Bipolar Transistor Amplifiers: Basic characteristics of the transistor, Transistor Amplifier, Common base amplifier, common emitter amplifier, Thermal stability, Hybrid equivalent circuit for a transistor, Low frequency response of transistor amplifier. High frequency response of transistor amplifier.
Scope: Electronic Devices and Circuits, Allen Mottershed, PHI, 18th Printing 1996
Chapters: 9,10,11,12,13,14,15,16.

Unit III
Negative feedback in transistor amplifiers. Transistor oscillators and multi-vibrators.
Scope: Electronic Devices and Circuits, Allen Mottershed, PHI, 18th Printing 1996
Chapters: 17,18.

Unit IV
Transistor Power Amplifiers: Class A, Class B and Class C.
Scope: Electronic Devices and Circuits, Allen Mottershed, PHI, 18th Printing 1996

Chapters: 19, 20.

Unit V
Field Effect Transistors: FET amplifier, MOS-FET, Other applications Opto-electronic devices, Thyristors and UJT's.

Scope: Electronic Devices and Circuits, Allen Mottershed, PHI, 18th Printing 1996

Chapters: 21, 22, 27, 28.

Reference Books:
1) Electronic Devices & Circuits: Millman and Halkias
2) Basic Electronics: B.L. Theraja
3) Electronic Principle: Ryder

Paper V
Electronic Instrumentation

Unit I Measurement and Errors: Definition, Accuracy and precision, Significant figures, Types of errors, Statistical analysis, Probability of errors, Limiting errors.

System of units: Measurement: Fundamental and derived units, System of units, Electric and magnetic units, International system of units, Other systems of units, Conversion of units.

Standards of measurement: Classification of standards, Standards of mass, length and volume, Time and frequency standards, Electrical standards, Standards of temperature and luminous intensity, IEEE standards


Chapters: 1, 2, 3.

Unit II Electromechanical indicating instruments: Suspension galvanometer, Torque and deflection of the galvanometer, Permanent-Magnet Moving-Coil mechanism.

DC ammeters, DC voltmeters, Voltmeter sensitivity, Series type ohmmeter, Shunt type ohmmeter, Multimeter, Calibration of DC instruments, Alternating - current indicating instruments, Thermo instruments, Watt-hour meter, Power-factor meter.


Chapters: 4

Unit III Bridge measurements: Wheat-stone bridge, Kelvin bridge, Guarded Wheat-stone bridge, AC bridges and their application, Maxwell bridge, Hay bridge, Schering bridge, Unbalance conditions, Wien bridge, Wagner ground connection.


Chapters: 5

Unit IV Electronic Instruments for measuring basic parameters: Amplified DC meter, AC voltmeter using rectifiers, True RMS responding voltmeter, Electronic multimeter, Considerations in choosing an analogue voltmeter, Digital voltmeter, Components measuring Instruments, Q-meter, Vector impedance meter, Vector voltmeter, RF power and voltage measurement.


Chapters: 6

Unit V Oscilloscopes: Oscilloscope block diagram, Cathode ray tube, CRT circuits, vertical deflection system, delay line, multiple trace, Horizontal deflection system, Oscilloscope probes and transducers, Oscilloscope techniques, special oscilloscopes.


Chapters: 7

Reference Books:
1) Basic Electronics by Malvino
2) Electrical Measurements by Goldy.
Paper VI

Mechanical Measurements and Transducers

Unit I Basic concepts of measurement: System calibration, Problem analysis, Basic characteristics of measuring devices, Calibration.
Transducer classification: Electrical transducer, Classification, Basic requirements.
Performance characteristics: Generalized measurements, Zero-order system, First-order system, Second-order system, Dead-time element, Specification and testing of dynamic response.
Chapters 1, 2 & 3

Unit II Measurement of displacement: Principal of transduction, Transducers. Potentiometers and LVDT.
Measurement of velocity: Revolution counters and Tachometers
Measurement of acceleration:
Measurement of strain: Types of strain gauges, resistance strain gauges, electrical strain gauges, strain gauge circuits (Bridge configurations), temperature compensation.
Chapters 4 & 5

Unit III Measurement of pressure: Diaphragms, Elastic elements, Transduction methods, Solid-state devices, Piezoelectric transducers. Calibration
Measurement of flow: Classification of flow meters, Head-type, Rotameter, Electromagnetic and Mechanical flow meters, Anemometers, Ultrasonic flow meters, Vortex and mass flow meters
Chapters 7 & 8

Unit IV Measurement of Temperature: Temperature scales, Mechanical temperature sensors, resistance type temperature sensors, Platinum resistance thermometer, Thermistors, Thermocouples, Solid state sensors, Temperature measurement by radiation method, Optical pyrometers, Calibration
Chapters 9

Chapters 10 & 6.1,6.2,6.3,6.4
Chapter 9

1) Practicals: 15 practicals based on three theory papers.
2) Enterprenership - 2

Reference Books :
2) O'Hignim - P.J. Basic Instrumentation - McGraw Hill.

Entrepreneurship-II
1. Subject overview: after completion of first year inputs, second year inputs will focus on business opportunity identification and managerial aspects of SSI.
3. Assessing project feasibility: concept of project feasibility, criteria for assessing project feasibility, importance of project feasibility in business opportunity selection.
4. Visit to small-scale industries: with a focus on how an entrepreneur selects his/her business opportunity (preferably units started by passed out students from the same college).
5. Interaction with entrepreneurs: On how entrepreneurs select a business opportunity and criteria they follow during the process.

7. Sources of information: Support institutional networking, national and stage level, whom to contact for what and other source of information.

8. General Management: Introduction to management, principles of management, principles in operation, key aspects of managing a small enterprise.

9. Production management in practice: installing and utilising project capacity, selecting appropriate technology and cost, purchase techniques.

10. Production Management: Importance of production, planning and control, tools and techniques.

11. Marketing Management: Concept and steps of marketing management, tools and techniques.


15. Business communication (Oral & written): Importance of business communication, how to improve oral and written communication, exercises.

16. Developing entrepreneurial competency: Knowing entrepreneurial competency profile and how to develop these competencies.

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.

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PAPER IV
HYBRID SEED PRODUCTION AND VEGETABLE SEED PRODUCTION

Unit-I : Introduction
- Definition of heterosis and inbreeding depression and brief history of the development of these concepts.
- Genetic, Physiologic and Biochemical basis of heterosis.
- Calculation of heterosis and its importance in crop improvement.
- Exploitation of heterosis at commercial scale in crops:
  - Maize, Perlmillet, Sorghum, Sunflower, Castor, Pigeonpea and Cotton.

Fixation of heterosis - an approach
- Aponixis and its exploitation - Hybrid Sorghum Rice
- Vegetative multiplication of ratoon - Hybrid Rice. and splitting of early tillers in rice seedlings in nursery.

- **Haploid breeding and its role in development of inbreds: Maize.**
- Definition of incompatibility, its kinds and importance
- Exploitation of incompatibility for hybrid seed production its advantages and disadvantages.
- Maintenance of self incompatible parental lines.
- Differences between sterility and incompatibility.

- **Devices for Hybrid Seed Production**
- Genetic male sterility and hybrid seed production
- Advantages and disadvantages of genetic male sterility.
- Role of marker genes linked with genetic male sterility.
- Procedure of hybrid seed production and maintenance of seed parent - Pigeonpea, Cotton and Sunflower.

- **Cytoplasmic - genetic male sterility.**
- Introduction to the system.
- Synchronisation methods of achievement.
- Seed production of CMS line ‘A’
- Seed production of maintainer line ‘B’
- Seed production of restorer line ‘R’
- Border rows, planting ration, live rear-kers.
- Hybrid seed production based on functional male sterility system: Its limitations and scope e.g. Tomato.
- Gametocides and their use in hybrid seed production
- Chemicals causing male castration.
- Effect on female organs.
- Effect on seed setting and seed quality.
- Environmental sterility and its exploitation in hybrid seed production in rice. A Chinese experience
- Role of environment in sex expression - potent- shedders
- Maintenance of parental lines - female sterility factors
- Pollination technique.

Unit-II - Hybrid Seed production in different crops.
floral biology, seed production planning, land and isolation requirement, wild pollinators, special agronomic practices, maintenance of varietal purity, field inspection, harvesting and threshing in the following crops.

1. Maize
2. Pearl millet
3. Sorghum
4. Sunflower
5. Pigeonpea
6. Cotton
7. Castor
8. Hybrid Rice
9. Hybrid Mustard
10. Safflower
- Economics of hybrid seed production
- Seed Planning

Unit-III : History and Objectives of Vegetable breeding
- History of vegetable crop improvement
- Objectives of vegetable breeding

Reproduction, Pollination Control Mechanisms
A. - Asexual Reproduction
   - Vegetative propagation
   - Apomixis
   - Artificial feeds
B. - Sexual Reproduction
   - Male gamete formation
   - Female gamete formation
   - Fertilization

C. Pollination Control Mechanisms
   a. Flowering habits
      - cucurbits
      - Asparagus
      - Spinach
   b. Self incompatibility
      - Gametophytic : in Lycopersicum spp. and solanum spp.
      - Sporophytic : Heteromorphic, Homomorphic
      - Incompatibility system in cauliflower and cabbage
      - Methods for breaking incompatibility :- Irradiation of pollen, application of NAA, IAA.
   c. Male Sterility
      - Genic male sterility in tomato, Brinjal and musk melon
      - Gene - cytoplasmic male sterility in onion, carrot, radish, cabbage and cauliflower.

: Natural Cross pollination
- Extent of natural cross pollination in vegetable crops
- Factors determining natural cross pollination
- of natural cross pollination in seed production of vegetable crops.
- Natural cross pollination and pollination vectors in vegetable crops

Hybridization techniques in Vegetables
- Raising of crop
- Equipments required
- Emasculation and use of gametocide
- Pollination methods - hand pollination, rubbing and hooking - use of electric bee.

Unit-IV : Breeding methods in vegetables
i. Role of introduction and thier utilization
   - Collection
   - Maintenance
   - Evaluation
   - Storage
ii. Selection
   a) Pure line selection
      - Definition
      - Method
      - Achievements
   b) Single plant Selection
      - Procedure
      - Achievements
   c) Clonal Selection
      - Collection of clones
      - Testing of Clones
      - Achievements
   iii) Hybridization with reference to vegetable crops.
      - Crosses between parents: single cross, double cross, three way cross, back cross, triple cross, hybrids.

Selection procedure in segregating progenies
   - Pedigree Selection
   - Bulk Method
   - Pure line family method (PLF)
   - Single seed descent method

iv) Population improvement
   - Mass Selection
   - Line breeding
   - Family breeding
   - Selfing and massing

Unit-V: Vegetable Seed Production
i) Introduction
   - Importance
   - Present Status & Future prospectus

ii) Classification of vegetable crops
   - Root crops
   - Bulbous crops
   - Leafy crops
   - Flowering & Fruit crops

iii) Requirements of Seed Production
iv) Effect of environment on Seed Setting and production
v) Methods of Seed production of the under-mentioned crops dealing with the aspects of

(a) Tropical Crops
   - Solanaceous: Brinjal, Potato, Chillies, Tomato
   - Cruciferous: Early Cauliflower, Turnip
   - Root Crops: Radish, Carrot, Colocasia
   - Leaf vegetables: Palak, Maithi etc
   - Bulb crops: Onion etc
   - Okra

(b) Temperate Vegetables
   - Cauliflower
   - Cabbage
   - Capsicum

(c) Hybrid Seed Production in Vegetables
   - Use of male sterile lines
   - Method of production of maintainers, pollen parents
   - Planting ratio of ‘A’: C lines
   - Insect pollination: Honey bees, Blow flies

PAPER-V
SEED TESTING

Unit-I: - Introduction, history and development
        - National and International organisations and seed testing linkages
        - Seed Testing Laboratory Layout and furnishing
        - Seed Testing equipments and their maintenance

Unit-II: - Seed Testing Laboratory Management & functioning
         - Seed Sampling, dividing
         - Heterogeneity Test
         - Handling and testing of the sample
Unit-III - Physical Purity Analysis
- Determination of Other Distinguishable Varieties
- Other Determinations
- Moisture Testing
- Germination Testing - requirements, seeding evaluation

Unit-IV - Rapid tests for seed quality determination
- Seed Vigour Testing
- Cultivar Purity Testing

Unit-V - Testing of Pelleted Seeds
- Uniformity in seed testing results & use of tolerances
- Record Keeping and reporting of results
- Storage of guard samples
- Seed testing in relation to Seeds Act & Marketing

PAPER-VI
SEED QUALITY CONTROL

Unit-I - General Introduction
- Seed quality its concept; physical purity, germination, health, and genetic purity.
- Concept of variety variation - heritable and non-heritable characters.

Seed quality control systems
- Seed legislation, seed certification

Seed legislation
- Objectives - Indian Seeds Act, Seed Rules and Seed Order
- Seed Inspector qualifications, duties and responsibilities.

Seed Certification
- Concept and history
- Classes of seed and phases of seed certification

Unit-II - Seed Certification Agency - its organisation
- Seed Certification Standards
- Land requirements and isolation distance
- Principles of field inspection

Unit-III - Techniques of field inspection of seed production plots of varieties and hybrids of cereals, pulses, oilseeds, forage & fibre crops, potato and vegetables

Unit-IV - Inspection at harvesting, threshing, processing
- Sampling for seed quality evaluation
- Issue of certificates and tags, sealing
- Testing of genetic purity of seed in grow out test particularly of cotton

Unit-V - Seed quality control organisation in India
- Composition and function of Central Seed Committee, Central Sub-Committee on Crop Standards, Notification and Release, Central Seed Certification Board, State Seed Committee.
- Management of Seed Certification Programme

Seed Certification Internationally
- Organisation of Economic Cooperation and Development Seed Certification Schemes.
- Future trends in Seed Certification
- Plant variety protection- Plant breeders rights

PRACTICALS
HYBRID SEED PRODUCTION
1. Studies on inflorescence, floral arrangement, floral morphology of some important crop plants. Cotton, Castor, Pigeonpea, Pearl millet and Maize.
2. Artificial masculination and pollination studies in Maize and Cotton.
3. Studies on protogynous and protandrous nature of flowers in Pearl millet and Sunflower.
   Disc flowers. Main capitulum and lateral capitula in restorers.
   Anthesis - Anther arrangement and time of anthesis.
   Stigma extrusion - Process of stigma extrusion and hour of extrusion.
   Pollination - Mechanism of cross pollination and self pollination in sunflower.
5. Floral structure of ‘A’ line, ‘B’ line and ‘R’ line. in reference to essential parts of the flower.
7. Identification and roguling of pollen shedders in C.MS.lines of Pearl millet, sunflower and sorghum.
8. Genetic male sterility and maintenance of female line in Pigeonpea hybrid.
   (i) Identification of genetic male sterile plants at bud initiation stage.
   (ii) Methods of identifying male sterile anthers by structure and colour.
Laboratory methods of confirmation by acetocarmine test under microscope. I in Pot iodide test.

Land requirement 5 Acres well irrigated land.

**VEGETABLE SEED PRODUCTION.**

1. **Raising of Nursery and Planting**
   - Nursery requirement and management for different vegetables
   - Seedling age for transplanting
   - Precautions, irrigation etc.

2. **Floral Biology of Vegetables**
   - Time for opening of flower
   - Time for anther maturity
   - Dehiscence of anther, hermaphrodite flowers

3. **Study of Pollen grains of Vegetables**
   - Collection of Pollen
   - Germination of pollen grains in water, Sugar solution Pollen gelly and other media.

4. **Selfing and Crossing Techniques in Vegetables**
   - Cucurbits
   - Solanaceous Crops
   - Onion and Carrot
   - Legumes - Pea and Beans
   - Cole crops
   - Garden beet and Palak
   - Okra
   - Lettuce

5. **Identification of Vegetable Seeds**
   - Temperate Vegetables
   - Tropical Vegetables
   - Temperate - tropical Vegetables

6. **Visit of the Vegetable breeding farm**
   - Experiments on Vegetable seed production, collection of seed, separation from pulp, drying etc.
   - Seed planning.

7. **Exercise on Planning of seed multiplication in different Vegetables.**

**SEED TESTING**

1. Sample registration and determination of the relative efficacy of various mixing and dividing techniques
2. Obtaining working sample, making separation, weighing, identification of purity components and reporting results.
3. Testing of the germination substrata and determination of moisture holding capacity of sand.
4. Platting the seeds for germination, seedling evaluation and reporting of results
5. Pre-treatments, pre-drying, pre-chilling, chemicals (KNo3, GA3), scarification; hot water treatment and delinting of cotton seed.
6. Tetrazolium testing of agricultural, vegetable and forestry seeds.
7. Moisture testing by oven drying method
8. Handling of moisture meters and determination of relative efficacy of moisture meters.

**SEED QUALITY CONTROL**

1. Filling of application form for seed certification
2. Exercise in field area measurement and field map preparation
3. Checking of seed source, isolation requirements
4. Observation in field inspection-
   - Identification of objectionable weed plants and inseparable other crop plants.
   - Study of stable morphological characters useful in identifying off-types in seed production plots.
5. Taking of field counts and filling of inspection reports of important field crops both hybrids and vars
6. Study of sampling techniques and equipment
7. Study of varietal purity through examination of seeds, seedling and plants, recording of data and filling result forms
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. Describe in detail the floral biology of the Specimen “A” classify upto family level.</td>
</tr>
<tr>
<td>2. Artificial emasulation and pollination/pilling of seed certification form in detail.</td>
</tr>
<tr>
<td>3. Raise a nursery bed for the given vegetable samples and describe.</td>
</tr>
<tr>
<td>4. Identify and describe vegetable seed specimens and equipments (M), (N), (O), (P)</td>
</tr>
<tr>
<td>5. Moisture testing by over drying method or seed germination test</td>
</tr>
<tr>
<td>6. Submission of on job training reports, specimens and viva voce</td>
</tr>
<tr>
<td>7. Record books</td>
</tr>
<tr>
<td>Total marks : 30</td>
</tr>
</tbody>
</table>

REFERENCES

4. Practicals in Plant Breeding : M.M. Bhandari
5. Cytogenetics and plant and Breeding Parthasarthy.
8. Sunflower Science and Technology : Jack. F. Carter
9. Castor : V.A. Moshkin
12. Insect Pollination of crops : J.B. Free
13. Pollination Mechanisms, : R. Frankel and E.Galun
15. Seed Production manual : NSC and Rockefeller Foundation-Publication.
17. Principles of seed certification and testing : N.P. Nema
19. Techniques in seed science : F.K. Agrawal and Technology M. Dadlani

20. Computer Application (Vocational)
(Effective from the session June/July 2007-08)

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

1) Practicals based on computer lab III 15 Marks
2) Practicals based on computer lab IV 15 Marks
3) Viva Voce (based on lab III & IV) 10 Marks
4) Record/Practical Journal 10 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 III: VISUAL PROGRAMMING**

**UNIT-I:** Introduction to VB, integrated development environment, tool bar, menu bar, Project explorer, tool box, Property window, form designer, form layout, immediate windows, renaming and saving, Project objects, events properties and methods.

**UNIT-II:** Selecting and using controls, command button, text box, labels, option button, list box, check box, combo box, image object, picture box, line object data control

**UNIT-III:** Working with variables, procedure and functions, code module using private and public sub procedure, creating and using functions, design time and run time change of properties, program flow, branching with IF. THEN, ENDIF, FOR...NEXT, looping operation, select case, GO TO, DO loop, while using data control.

**UNIT-IV:** Interacting with Data: database and visual basic, data control, advance data control usage, advanced database control using VB application wizard.

**UNIT-V:** Printing output in VB: Printing information using print collection, Controlling output, Scaling output, formatting with fonts, Simple VB Programmes. Connection with Database.

**Books recommended**
1) Visual Basic in 21 Day’s: Grey Pery (Techmedia)
2) Visual Basic 6.0 Programming guide: Microsoft Press.
3) Guide to VB: Petmnoren- (Techmedia)
4) V.B.6 for window: Davis (Addison – Wesley)
5) Mastering Visual Basic - Evangelous Petroutsos - BPB

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**PAPER-IV: RELATIONAL DATABASE MANAGEMENT SYSTEM**

**UNIT-I:** Fundamentals of DBMS, RDBMS, Data Base Models, Architecture of Data Base Systems. Entity, Relationship, domain & Attributes, keys, Functional Dependencies, Normalisation:

**UNIT-II:** Introduction to SQL: Variables & constants, data types, operators & conditions, DDL commands: Create, Alter, Drop. DML commands: select, insert, update, delete. DCL Command: Commit, Rollback. Functions: Numeric Functions, Character Functions, Conversion Functions, Group Functions.


**UNIT-IV:** Security concept, types of Security, user ID, security object, types of privileges : Grant, revoke privileges. Column, passing privilege. Database Triggers, Procedures

**UNIT-V:** Dynamic SQL: Limitation of static SQL, basic concept of dynamic SQL, Dynamic statement execution, Dynamic queries. SQL * Forms, creating forms, entering data, running forms, editing forms, Creating & running Reports.

**Books Recommended:**
1) Understanding Oracle: James J. Perry, J.Q.Lqteer
2) Essential of Oracle7: Tom Luers
3) Oracle complete reference: Koch & Loney
4) Introduction to DBMS: Majumdar & Bhattacharya

**Books for additional reading:**
1) The complete reference SQL (with CD): James R. Groff & Pawl N. Weinbarg(Tata Mac)
2) Oracle developers guide: Carol M. C. Dieter
3) Database management system: Corey
4) Database system concept: Korth & Silberschatz

**PRACTICALS**

**COMPUTER LAB III:** Minimum 16 practicals based on Syllabus of Paper-III

**COMPUTER LAB IV:** Minimum 16 practicals based on Syllabus of Paper-IV
Study tour: Study tour may be arranged to computer industry/software development organisation/institutes, software park, IT park.

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List of equipments- (Minimum requirement) For Computer-Science/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.

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21. FOOD SCIENCE

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

The examination in Food Science will comprise of two theory papers and a practical. Each theory paper shall be of three hours duration and carry 60 marks. The practical shall be of 06 Hours duration and shall carry 30 marks. The distribution of practical marks shall be as follows:

1. Record 05 marks
2. Viva-voce 10 marks
3. Exercise 15 marks

Total : 30 marks

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PAPER-III

FUNDAMENTALS OF NUTRITION


Unit III: Definition, classification, sources and functions of vitamins. Requirements and deficiency symptoms of vitamins. Loss of vitamins in processing.


Unit V: Concept of Balanced diet. Energy value of foods. BMR and its measurement. RDA for different age groups. Antinutritional factors, toxic constituents in foods, and their detoxification. Fortification and enrichment of foods.

BOOKS RECOMMENDED:
1) “Essentials of Food and Nutrition” by Swaminathan M.S., The Bangalore Printing and Publishing Co. Mysore Road, Bangalore.

PAPER-IV

FOOD MICROBIOLOGY


Unit II: Isolation, characterization of reproduction of microorganisms. Growth cycle of microorganisms synchronised of balanced


Unit IV: Effect of dehydration, irradiation of chemicals on growth of microorganisms. Evaluation of antimicrobial agents control of microorganism by physical & chemical methods.


BOOKS RECOMMENDED:

PRACTICALS
1) Estimation of Vitamin ‘C’ by dye titration.
2) Estimation of Iron by Wongs method.
3) Estimation of Calcium by EDTA titration.
4) Identification of microorganisms by gram staining, spore staining.
5) Identification of yeasts & molds.
6) Enumeration of microorganisms by SPC and MPN.
7) Microbiological analysis of water.

List of Recommended Equipment for a Batch of 16 Students
1. Hot air oven. 2/Batch
2. Incubator microbiological 1/Batch
3. Quickfit Nitroen digestion/distillation assembly (Set of six) 3/Batch
4. Controlled Temp. Water bath. 4/batch
5. Analytical balance. (Digital preferred) 4/Batch
6. Weight box 16/Batch
7. Dessicators. 3/Batch
8. Magenetic Stirrer 8/Batch
9. Water Suction 1/Batch

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. Seperating funnel 4/Batch
7. Microscopic slides/Coverslips6 doz/Batch
8. Test tubes 16 dox/Batch
9. Pippettes Vol-10ml 16/Batch 5ml 1/Batch 1ml 1/Batch
10. Pippettes. Graduated- 10ml 16/Batch
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-III**

**SEED PRODUCTION AND FISH PATHOLOGY.**

**Unit-I**: Principles of fish breeding. Different stages of seed—Eggs, Spawn, fry and fingerlings Riverine collection. Transportation of fish seed and brood fish. Life cycle of penaeid and non-penaeid prawn.

**Unit-II**: Pituitary gland and its role in fish breeding. Methods of fish and prawn breeding: induced breeding, bundh breeding, ovulating agents used (fish pitutary glands, HCG, pheromones and new generation drugs). Factors influencing fish breeding.

**Unit-III**: Hatching techniques. Different types of hatcheries; hatching hapa, vertical jar hatchery, chinese hatchery, D-variety hatcheries, prawn hatcheries and their management.

**Unit-IV**: Different types of farms and ponds. Topography, design, layout and construction of a fish seed farm. Nursery-rearing ponds, their preparation an management; harvesting of fry and fingerlings.


**PAPER-IV**

**AQUACULTURE**

**Unit I**: Definition, history, scope and importance of aquaculture, Status of aquaculture in different countries, Extensive, semi-intensive and intensive culture.

Different systems of aquaculture-monoculture, polyculture, integrated farming, pond culture, cage culture, pen culture, raft culture, raceway culture, culture in recirculatory water system, warm water and cold water aquaculture, sewage-fed fish culture.
Unit-II: Concept and principle of aquafarm management. Preparation of stocking pond; Prestocking management, predators and their control. Aquatic weeds, algal blooms and their control. Liming and fertilization.


Unit-IV: Characteristics of brackishwater. Brackishwater resources of India. Existing culture practices in bheris, pokkali paddy fields and kharlands. Breeding and culture of brackishwater finsfishes-milkfish, gray mullets, poearl-spot, cock-up, etc.

Unit-V: Mariculture-culture of edible oysters, mussels, clams, cockles, sea urchins, sea cucumber, etc. Pearl oyster culture. Culture of sea weeds. Important species of cultivable penaeid and non-penaeid prawns. Tiger prawn culture, fresh water prawn culture. Polyculture of prawns with finfish. Air-breathing fish culture.

PRACTICALS

I. Collection and analysis of soil and water, samples for physio-chemical characteristics; study of food cycle in a pond, collection and identification of fish food organisms. Visits to farms to study different systems of aquaculture.


IV. Identification of important species of brackishwater finsfishes and shellfishes an their seed. Collection and rearing of brackishwater shrimps and fishes. Identification of cultivable species of prawns oysters, mussels, clams, sea weeds, etc. Visits to prawn hatcheries and mariculture centres.


Practical Examination

Practical Examination will be of six hours duration and for total 30 marks.

Q. 1 Identification of spots I to X (Fishes and prawns 4, Weeds-2, Predators and parasites-2, Plankton slides-2) - 10 Marks
Q. 2 Water analysis experiment. - 5 Marks
Q. 3 Dissection of pituitary gland OR Preparation and administration of pituitary extract. - 5 Marks
Q. 4 Submission of collection, food preparation, permanent slides - 4 Marks
Q. 5 Record and field diary - 4 Marks
Q. 6 Viva voce - 2 Marks

Total: 30 Marks

EQUIPMENTS AND FACILITIES

1. Earthen ponds(0.05-0.1ha) - 2
2. Cement cisterns (25 m²) - 4
3. Portable chinese hatchery - 1
4. Breeding hapas - 4
5. Hatching hapas - 6
6. Drag net - 1
7. Hand nets - 3
8. Compound microscopes - 4
9. Occular micrometers - 4
10. Centrifuge - 2
11. Homogeniser - 6
12. Syringes - 12
13. Needles - 24
14. Catheter - 3
15. Drippers - 12
16. Beakers (assorted) - 12
17. Emamel trays - 6
18. Plastic drays - 6
19. Refrigerator - 1
20. Hot air oven - 1
21. Hand mince - 1
22. Water analysis kit - 1
23. pH meter - 1
24. O2 analyser - 1
25. Spectrophotometer - 1
26. Colorimeter - 1
27. Plankton nets - 3
28. Plastic pools - 6
29. Sieves for soil texture analyses - 1 set
30. Sedgwick Rafter Cells - 2
31. Glass troughs - 12
32. Pressure cooker - 1
33. Millipore filters - 6
34. Autoclave - 1
35. Phase contrast microscope - 1
36. Microtome - 1

Facility for tissues block making, staining and mounting, glassware for analysis of carbon dioxide, alkalinity and ammonia, petri dishes, test tubes, etc.

REFERENCES
35. Project report on breeding of carps with ovaprim in India. Nandeesh, M.C. & Others. AFSIB, Mangalore.
42. Pond culture of the Malaysian Prawn, Macrobranchiura Rosenbergii. Theodore, I.J.S. and Others, USDC, NTIS.

23. COMPUTER MAINTENANCE (VOCATIONAL)

The Examination in Computer Maintenance will comprise of two theory papers & one practical. Each theory paper will be of three Hrs. duration & carry 60 marks. The practical examination will be of 6 Hrs. duration & 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.

Distribution of Practical marks are as follows.
1. Practical based on computer lab.-I  9
2. Practical based on computer lab.-II  9
3. Viva-Voce on 1 & 2  6
4. Practical journal / Record  6

Total  30

Paper-III
(Microprocessor & Interfacing)

Unit-I : Introduction to microprocessor, Explanation to terms, Evolution of microprocessor, Microcomputer programming languages, Practical application, Microcomputer architecture, Single chip microprocessors, CU, ALU, Memory. I/O, Characteristics of Interrupts I/O, DMA, Coprocessor.

Unit-II : Microcomputer S/W concepts, Instruction formats, Addressing modes, Instruction types, ALP, 8085 mpu : Register structure, memory addressing. Interrupt system in 8085, Important features of 8086, 80486 and pentium.

Unit-III : Intel 86 : Introduction, Architecture, Register, Addressing modes, Data X’fers, Arithmetics, Bit manipulation, String, Unconditional X’fer, Conditional branch, Iteration control, Interrupt, Processor control, Assembler Dependent & Assembler pseudo instructions, I/O, IOP (8089), 86 Interrupts, 86 DMA.

Unit-IV : Peripheral Interfacing : Parallel vs Serial interfacing, Synch. & Asynch. data S’mission, USART, UART, keyboard /Display interfacing, cCassatte recorder I/P Concept, CRT interfacing &

**Books Recommended:**
1. Microprocessor Theory and Application (revised edition) - M. Raffiquellazammam
2. Microprocessor & interfacing - D.V. Hall.
4. Intel Microprocessor’s (fourth edition) - Barry Brey.
6. IBM PC Assembly Language & Programming - Peter Abel.

**PAPER-IV**

**C LANGUAGE WITH ALP**

**Unit-I**: **Introduction to C**: Introduction, Simple C program, character set, Keywords, Identifier, Variables, Data types operators, Expressions, Statements, Functions.

**Unit-II**: **Conditional statements, Loops & functions**: Relational operators, Logical operators, Conditional branching statements, conditional operators, Loops, Jumping functions, Anatomy of functions, Writing own functions, Function call.

**Unit-III**: **Arrays, Structures & Pointers**: Declaring & initialising arrays, Accessing array elements, Single dimensional array, 2-D arrays, Introduction to structures & Pointers.

**Unit-IV**: **Advance C**: Storage class specifiers: Auto, Register, Static, External, C preprocessor, Conditional compilation. Using assembly language in C: Clear Screen program for C, Compilation & Linking, Passing multiple parameters, summary on writing C procedures in assembly, Writing in-line assembly code in C, Summary on in-line assembly in C.

**Unit-V**: **C language with ALP using BIOS & DOS functions**: Procedures examples, Setting cursor, Clearing screen, Screen & K/B operation, Display on the screen, Display ASCII character set, Accepting input from K/B Display name.

**PRACTICALS**:
- Computer Lab I: Based on syllabus of Paper-I (Min. 10 experiments)
- Computer Lab II: Based on syllabus of Paper-II (Min. 10 experiments)

**LIST OF EQUIPMENTS/SOFTWARES**

1. (a) Oscilloscopes (15/20 Hrs.) - 3 Nos.
2. Oscilloscope (100 Hrs.) - 1 No.
3. Power Supplies - 4 Nos.
4. Digital and Analogue Multimeter - 10 Nos.
5. Bread Boards - 10 Nos.
6. Microprocessor Kit / Mother board - 4 Nos.
7. Digital IC Tester - 2 Nos.
8. PC (80286, 8086 XT) Trainer Kits - 3 Nos.
10. 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.
25. Vacuum Cleaner - 1 No.
26. Computer Spares & Cards related to syllabus - 2 No Each
27. Licensed Softwares related to Syllabus & General functionality - 1 No. Each
PAPER-IV
BIOPHYSICS, MATHEMATICS, BIOSTATISTICS AND COMPUTER


Unit-II  Physical methods applied to find out molecular structure: X-ray crystallography and NMR. Physical methods of imaging intact biological structures: Ultrasound, Optical filters, X-ray, CAT scan, ECG, EE, NMR imaging.

Unit-III  The set theory, properties of subsets, Linear and geometric functions, Limits of functions, derivatives of functions, The binomial theorem, Logarithm, Differentiation and Integration.

Unit-IV  Biostatistics: Probability calculations, Methods of sampling, Measurement of Central tendencies (Mean, median, mode), Measures of dispersions (range, mean deviation and standard deviation), ANOVA.

Unit-V  Computers: General introduction to computers, organization of computers, digital and analogue computers, computer algorithm. Computers in on line monitoring and automation. Application of computers in co-ordination of solute concentration, pH and temperature etc of a fermenter in operation.

PAPER-V
MOLECULAR BIOLOGY

Unit-I  Molecular basis of life, Structure of DNA, DNA replication in prokaryotes and eukaryotes. DNA recombination: molecular mechanisms in prokaryotic and eukaryotic organisms. Insertion elements and transposons.

Unit-II  Structure of prokaryotic genes, Prokaryotic transcription, Prokaryotic translation and Prokaryotic gene expression (lac, his, trp, catabolic repression).

Unit-III  Structure of eukaryotic genes, Eukaryotic transcription, Eukaryotic translation and Eukaryotic gene expression, transcription factors.

Unit-IV  Gene expression in yeast, Gene expression in protozoan parasites and Gene organization and expression in mitochondria, chloroplasts.


PAPER-VI
IMMUNOLOGY AND RECOMBINANT DNA TECHNOLOGY

Unit-I  The Immune system and Immunity along with historical perspective. The organs and the cells of the immune system and their function. Antigen-antibody, their structure and interaction.

Unit-II  Humoral and cell mediated immunity (role of MHC and genetic restriction). Origin of diversity in the immune system, Effector mechanisms and Immunity to infectious diseases, vaccines

Unit-III  Gene cloning and its importance: Tools and techniques: genomic DNA, handling of DNA, RNA, cDNA, RT enzymes and other reagents & techniques. Vehicles: Plasmids and bacteriophages, available plasmids, cosmids, viruses. Safety measures and regulations for recombinant DNA work, choice and selection of the tools and techniques.

Unit-IV  Purification of DNA from bacterial, plant and animal cells. Introduction of DNA into living cells, cloning vectors for E.coli, Cloning vectors for organisms other than E. coli, yeast, fungi, plants- agrobacterium, plant virus and animal viruses.
Unit-V  Application of cloning in gene analysis:-

PRACTICALS
1. Separation of cell types (from blood).
2. Separation of cell organelles:
   - Methods for cell lysis: rupture Osmotic/Chemical/Enzymatic lysis of cells followed by centrifugation. Monitoring cell lysis by release of cellular material and by change in light scattering etc.
   - homogenization, centrifugation of cell organelles.
3. Extraction of cellular materials:
   - Extraction in saline buffers,
   - Extraction in solvents and
   - Precipitation from extracts.
4. Separation of the constituent molecules of the extract in aqueous buffer,  
   - Adsorption chromatography,
   - Ion exchange chromatography and Thin layer chromatography of extracted material.
Demonstration of chromosomal and plasmid DNA from bacteria. Restriction digestion of DNA. Separation of digested DNA by Gel electrophoresis.
5. Purification of antigens.
6. Enzyme-linked immunoassay.
7. Antigen - antibody reaction test (Widal test, Blood grouping, Pregnancy and VDRL test)
8. Radial immunodiffusion analysis.
9. Visit: Training programme for students - The students should be assigned visit/training programme in clinic/hospital, dairy, water purification plant or biotechnological based industry, post graduate /research institution. Students should submit report of training/visit.

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) Training/Visit/study tour report .......  05
Total : 30

Note: Major and minor experiment shall be decided by the internal examiner.

Books Recommended:
1. Methods in Biostatistics : B.K. Mahajan
2. Basic Biotechnology : Rev. Fr. Dr. S. Ignacimuthu
3. Molecular Biology & Biotechnology : H.D. Kumar
4. Text Book of Biotechnology : G.R. Chhatwal
5. A Text Book of Biotechnology : R.C. Dubey
6. Modern Biotechnology : S.B. Primrose
7. Biotechnology : Trehan K.
9. Biochemistry : Lehninger
10. Text Book of Microbiology : R. Ananthanarayan and C.K. Paniker

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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</table>
2. Autoclave 
   a. Portable
Yarco/Wiswo or any Std.make
3. Incubator
Yarco/Tempo/Lab. Hosp.or any std.make
4. Hot air oven
Yarco/Tempo/Lab.Hosp.or any Std.make
5. Environmental Growth chamber
6. Laboratory Shaker/Platform Shaker
7. Colorimeter
Erma/Elicol Systronics or any std.make
8. UV-Vis spectrophotometer
9. Tissue culture racks with illuminators.
10. Vertical & horizontal
    electrophoresis apparatus
    with power pack
Genei/any std.make
11. Single pan electrical
    balance
    Systronics/K.Roy contac
    or any std. make
12. Cyclo-Mixer
    Remi/Tempo/or any std.make
13. High Speed cooling
    centrifuge/with micro
    + 4X100 ml rotar.
    centrifuge rotor.
14. UV Transilluminator/UV torch,
    Male Genei/Fotodyne with dual lamps.
15. Computer with Internet facility,
16. Microscope a Monocular
    Olympus/Metzer/Labo.or any other std.make
17. Oil Immersion lens
    Olympus/Meopta Labo/or any std. make
    (preferably Imported)
18. Serological Water bath
    Yarco/Tempo/Lab Hosp or any std.
19. Laminer Air-flow (Hozt.)
    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. Epidiscope
    Metzer/Photophone or other std. make
30. Slide Projector
    Metzer/Photophone or other std. make

25. INDUSTRIAL MICROBIOLOGY
The examination in Industrial Microbiology comprised 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. Theory paper is of three hours duration and shall carry 60 marks each. Each practical examination will last for at least two consecutive date with minimum working hours each day. The syllabus is based on six theory periods and six practical periods per week.

Paper-III
(Industrial Fermentations and Metabolism)

Unit-I: - Fermentation Metabolism and enzyomology:-
A) a) Metabolism, Definition and general strategy.
   b) Metabolic Pathways (EMP, TCA, Oxidative Phosphorylation, and E.T.C.)
   c) General concept of Respiration and fermentation.
   b) Classification and nomenclature of Enzymes.
   c) Terminologies used in Enzymology.

Unit-II: - Biomass production:-
A) Bacterial biomass production (Bacillus megaterium)
B) Yeast Biomass production (Torula yeast)
C) Fungel biomass (Candida utilis)
D) Biofertilizer production (Bacterial, Algal and Mycorrhizal)
E) Microbial insecticide production (Bacterial, viral and fungal insecticides)

Unit-III: - Fermentation of Alcoholic Beverages and amino-acids
A) Ethyl alcohol production from molasses, and waste sulphite liquor.
B) Beer production.
C) Wine production
D) Amino acid production (glutamic acid and L-lysine)

Unit-IV :- Fermentation of acids, enzymes and vitamins
A) Vinegar production (Orlean’s process and Fring’s generator)
B) Lactic acid production (from whey)
C) Citric acid production (Surface and submerged process)
D) Amylase (bacterial and fungal)
E) Vitamin (Riboflavin)

Unit V :- Antibiotics and Vaccine production
A) Antibiotics, Definition and applications.
B) Penicillin production.
C) Streptomycin production
D) Vaccine, Definition and types
E) Production of BCG Vaccine (live attenuated vaccine)
F) Salk vaccine (Killed vaccine)
G) Toxoid (Diphtheria, Tetanus)
H) Control, testing and Standardization of vaccines.

Paper IV
Food and Dairy Microbiology

Unit I :- Food Microbiology
A) Sources of Contamination of Fresh foods
B) Microbial Spoilage of Foods.
C) Preservation of Foods
   i) Low & High temperature
   ii) Dehydration
   iii) High osmotic pressure
   iv) Chemical preservation
   v) Radiation
   vi) Canning.
D) Food Poisoning :
   i) Food Infection
   ii) Food Intoxication.

Unit II :-Milk Microbiology
A) Definition, Composition & types of milk.
B) Sources of microorganisms in milk

C) Types of microorganisms in milk.
D) Pasteurization of milk - LHT, HTST, UHT.
E) Phosphatase test & its application
F) Quality & Grades of milk.

Unit-III:-Fermented food products
A) Introduction
B) Some important fermented food products.
   i) Pickles
   ii) Sauerkraut
   iii) Idli
   iv) Bread
   v) Oriented food product.

Unit IV :- Fermented Milk Products.
A) Introduction
B) Selection of raw milk for manufacture of fermented milk.
C) Production of Yogurt, Dahi & Cheese
D) Cultured Butter milk - Lassi, Chhach
E) Acidophilus milk products
F) Production of Kefir, Kaumiss & Leben
G) Nutritional & therapeutic value of fermented milk products
H) Defects & spoilage of fermented milk products.
I) Tests & Standards for fermented milk products.
J) Pathogens in fermented milk products.

Unit V:- Meat & Fishery Products
A) Spoilage of fresh and processed meat, fish and poultry.
B) Fermented sausages and country cured hams.
C) Fish sausages
D) Microbiological quality of various sea food products
E) Preservation of meat fish and poultry.

Practicals
1) Microbiological Examinations of milk.
   A) Plate Count
   B) Methelene Blue Reduction test
   C) Test for Coliforms
   D) Phosphatase test
   E) Estimation of fats in milk.
   F) Demonstration of microbes in curd
2) Microbial Examination of vegetables, fruits, egg, canned food & ice cream
   A) Plate count
   B) Test for coliforms
   C) Yeast & molds
3) Demonstration of Mushroom Cultivation.
4) Isolation & study of food spoilage micro organisms from Sweets & Bakary Products.
5) Test of Sterility of food products
6) Production & estimation of alcohol
7) Production & estimation of citric acid.
8) Demonstration of enzyme production by micro organisms (eg. Amylase)
9) Immobilization of yeast
10) Isolation of antibiotic producing micro organisms from soil.
11) Estimation of Riboflavin.
12) Study Tour

Distribution of marks for Annual Practical Examination.
1) Two minor experiments 06
2) One major experiments 08
3) Spotting 05
4) Viva-Voce 05
5) Study tour report 04
6) Class record 02
Total 30

List of recommended books--
1) Fermentation technology by Whittakar
2) Industrial Microbiology by Casida, L.E. (Wiley Eastern Ltd. Publication)
3) Industrial Microbiology by A.H. Patel (Macmillan Publication)
4) Fundamentals of Dairy Microbiology by J.B. Prajapati (Akta Prakashan)
5) Modern Food Microbiology by James M.Joy (B.S.Publication)
6) Industrial Microbiology by B.M. Miller and W. Litsky
7) Outlines of Dairy Bacteriology by Sukumar De.
8) Industrial Microbiology by Prescott and Dunn
9) Food Microbiology by Frazier
10) Industrial Microbiology by Rose

26. BIOINFORMATICS
   (Introduce from the session 2009-2010)
   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.
   The practical examination shall be of six hours duration and carry 30
   marks.

   PAPER-IV
   Fundamentals of Biochemistry
   Unit I : Water as the universal biological solvent, concept of osmolarity,
            ionization of water, weak acids and bases.
   Unit II : Carbohydrates - Definition and classification of carbohydrates.
            Structure, occurrence and biological importance of
            Monosaccharides, Disaccharides, Oligosaccharides,
            polysaccharides and Mucopolysaccharides. Proteoglycans and
            glycoproteins.
   Unit III : Lipids – Fatty acids: Classification, Nomenclature, structure and
            properties of saturated and unsaturated fatty acids. Simple and
            compound lipids, Triacylglycerols, Glycerophospholipids,
            glycolipids, Isoprenoids and steroids. Biological functions of
            lipids.
   Unit IV : Proteins – Principles of protein structure, basic building blocks
            of proteins, Hierarchical organization of protein structure –
            Primary, Secondary, Tertiary and quaternary structure,
            Denaturation and Renaturation of proteins. Biological functions
            of Proteins.
   Unit V : Enzymes - General characters and properties of enzymes.
            Nomenclature of enzymes. Holoenzymes, apoenzymes, active
            site of an enzyme, isoenzymes. Mechanism of enzyme action.
            Factors affecting rate of enzyme catalyzed reactions. Enzyme
            kinetics. allosteric inhibition.

   Recommended books:
1. Lehninger’s principles of Biochemistry by Nelson, Cox (M.M.
   Macmillan, New York.)
2. Fundamentals of Biochemistry by Donald Voet, Judith Voet, Charlotte
   Oratt. (John Wiley and Sons, N.Y.)
3. Text Book of Biochemistry by Dr.O.P.Agrawal.
5. Text Book of Biochemistry by West and Todd.

**PAPER-V**

**Fundamentals of Molecular Biology and Immune System**


**Unit II:** Fundamentals of Structural, Comparative and Functional Genomics and its applications. Genome Sequencing, Introduction to Genome Analysis. Structure of Prokaryotic and Eukaryotic Genomes. Transcription of Prokaryotic and Eukaryotic Genes. Regulation of Gene Expression.

**Unit III:** Translation in Prokaryotics, Eukaryotics, Translation factors, Initiation, Elongation and Termination of Translation. Regulation of translation. Structure of Prokaryotic and Eukaryotic Ribosomes.


**Unit V:** Humoral and Cell Mediated Immunity, MHC and immunity to infectious diseases. Vaccines, Lymphocytes Trafficking, T-Lymphocytes-cells, B-Lymphocytes-Cells, Macrophages, Dendritic Cells, Natural Killer Cell and Lymphokine Activated Killer Cells, Eosinophiles, Neutrophiles and Mast Cells. (Antigen Presenting Cells, Cell Mediated Subset of T-cells, helper and suppressor cells, cell mediated and humoral immunity, antibody dependent cell mediated cytoxicity, NKcells.)

**Books:**
(1) Essentials of Molecular Biology – D. Freifelder
(2) Elements of Biotechnology – P.K.Gupta
(3) Genes VI – Benaznin Lewin
(5) Molecular Cell Biology, Lodish (5th Edition)
(6) Immunology : An Introduction – Iam R. Tizard
(7) Fundamentals of Immunology, William Paul
Practical:
1. Paper Chromatography of Amino Acid.
2. Paper Chromatography of Carbohydrates.
3. TLC
4. Estimation of Carbohydrate by Qualitative Methods.
5. Estimation of Carbohydrate by Quantitative Methods.
7. Learning the Internet System in the Laboratory and Getting its Characteristics.
9. Retrieval of Data from NCBI/SWISS Prot Databank and Analysis of Motif
11. Multiple Sequence Alignment of Plant Protein using Clustal-W
12. Retrieval of 3D Structure of Protein from PDB.
13. Citation of Literature using pub med.
14. General Purpose Utilities, Cal, Date, Eco, Printf, be, Script, passwd, who etc.
15. The File System: pwd, cd, mkd, rmdir, etc.
16. Handling Ordinary Files: Cat, cp, rm, m,v, more, wc, od, cmp, tar, zip, unzip, etc.
17. Basic File Attribute: ls, chmod etc.
18. The vi editor: Basic Commands.

List of Equipments:

<table>
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<th>Quantity</th>
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<td>Legal Software Windows-XP</td>
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27. ENVIRONMENTAL STUDIES
Total Marks: 100
PART-A
SHORT ANSWER PATTERN 25 Marks
1. The Multidisciplinary nature of environmental studies
   . Definition, scope and importance.
   . Need for public awareness.
   (2 lecture hours)
2. Social Issues and the Environment
   . From Unsustainable to Sustainable development
   . Urban problems related to energy
   . Water conservation, rain water harvesting, watershed management
   . Resettlement and rehabilitation of people; its problems and concerns.
   . Case studies.
   . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
   . Wasteland reclamation.
   . Consumerism and waste products.
   . Air (Prevention and Control of Pollution) Act.
   . Wildlife Protection Act.
   . Forest Conservation Act.
   . Issues involved in enforcement of environmental legislation.
   . Public awareness.
   (7 lecture hours)
3. Human Population and the Environment
   . Population growth, variation among nations.
Environment and human health.

Human Rights.

Value Education.

HIV / AIDS.

Women and Child Welfare.

Role of Information Technology in Environment and human health.

Case Studies. (6 lecture hours)

PART-B

ESSAY TYPE WITH INBUILT CHOICE 50 Marks

4. Natural resources:
   - Renewable and non-renewable resources:
     - Natural resources and associated problems.
     - Forest resources: Use and over exploitation, deforestation, case studies.
       Timber extraction, mining, dams and their effects on forests and tribal people.
     - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
     - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
     - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
     - Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
     - Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
   - Role of an individual in conservation of natural resources.
   - Equitable use of resources for sustainable lifestyles.

5. Ecosystems
   - Concept of an ecosystem.
   - Structure and function of an ecosystem.
   - Producers, consumers and decomposers.
   - Energy flow in the ecosystem.
   - Ecological succession.

6. Biodiversity and its conservation
   - Introduction - Definition: genetic, species and ecosystem diversity.
   - Biogeographical classification of India.
   - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
   - Biodiversity at global, National and local levels.
   - India as a mega-diversity nation.
   - Hot-spots of biodiversity.
   - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
   - Endangered and endemic species of India.
   - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

7. Environmental Pollution
   - Definition
     - Causes, effects and control measures of:
       - Air pollution
       - Water pollution
       - Soil pollution
       - Marine pollution
       - Noise pollution
       - Thermal pollution
       - Nuclear hazards
   - Solid Waste Management: Causes, effects and control measures of
     - Role of an individual in prevention of pollution.
     - Pollution case studies.
     - Disaster management: floods, earthquake, cyclone and landslides.
8. Field work

- Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(Notes:
  i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
  ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
  iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES: -

2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email: mapin@icenet.net (R)
4) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7) Down to Earth, Centre for Science and Environment (R)
9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai (R)
14) Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
18) Survey of the Environment, The Hindu (M)
20) Dr. Deshpande A.P., Dr. Chudiwale A.D., Dr. Joshi P.P. & Dr. Lad A.B. : Environmental Studies, Pimpalapure & Company Pub., Nagpur.
21) द्राक्षे वित्तल धार्मिक : पर्यावरणशास्त्र, पिपलुणास ओळ्ड खेळल्यांनी पक्षपात, नागपूर.

(M) Magazine
(R) Reference
(TB) Textbook


******
1. This Ordinance may be called “Examination in Environmental Studies leading to Bachelor Degree, Ordinance, 2005.”

2. This Ordinance shall come into force from the Academic session 2005-06.

3. In this Ordinance and in other ordinances relating to the examination, unless there is anything repugnant in the subject or context :-

   (i) “Academic session” means a session commencing on such date and ending with such date of the year following as may be appointed by the Management Council.

   (ii) “Admission to an examination” means the issuance of an admission card to a candidate in token of his having complied with all the conditions laid down in the relevant ordinance, by a competent officer of the University.

   (iii) “Applicant” means a person who has submitted an application to the University in the form prescribed for admission to an examination.

   (iv) “Candidate” means a person who has been admitted to an examination by the University.

   (v) “Regular Candidate” means an applicant who has applied for admission to a University examination through an affiliated college, Department or Institute in which he/she has prosecuting a regular course of study.

   (vi) “Examinee” means a person who present himself/herself for an examination to which he/she has been admitted.

   (vii) “Examination” means an examination prescribed by the University under the relevant Ordinance.

   (viii) “External Candidate” means a candidate who is allowed to take a University examination in accordance with the provision of Original Ordinance No. 151.

   (ix) “Non-Collegiate Candidate” means a candidate who is not a collegiate candidate.

4. Save as otherwise specifically provided, the conditions prescribed for admission to the examination under this Ordinance shall apply to all persons who wish to take the examination to the Degrees of the University mentioned in para 5 below.

5. The conditions prescribed for admission to examination under this Ordinance shall apply to following degrees of the University :-

   1) Bachelor of Arts
   2) Bachelor of Performing Arts
   3) Bachelor of Fine Arts
   4) Bachelor of Mass Communication
   5) Bachelor of Social Work
   6) Bachelor of Commerce
   7) Bachelor of Business Administration
   8) Bachelor of Science
   9) Bachelor of Computer Science
   10) Bachelor of Computer Applications
   11) Bachelor of Pharmacy
   12) Bachelor of Science (Home Science)
   13) Bachelor of Technology (Cosmetics)
   14) Bachelor of Engineering
   15) Bachelor of Engineering (Part Time) (Civil)
   16) Bachelor of Textile
   17) Bachelor of Technology (Chemical Technology)
   18) Bachelor of Technology (Chemical Engg.)
   19) Bachelor of Architecture, and
   20) Bachelor of Laws (Five Year Course)
Environmental Studies shall be a compulsory subject for a previous year examination of the following Bachelor Degrees of the University:

1) Bachelor of Arts
2) Bachelor of Performing Arts
3) Bachelor of Fine Arts
4) Bachelor of Mass Communication
5) Bachelor of Social Work
6) Bachelor of Commerce
7) Bachelor of Business Administration
8) Bachelor of Science
9) Bachelor of Computer Science
10) Bachelor of Computer Applications
11) Bachelor of Pharmacy
12) Bachelor of Science (Home Science)
13) Bachelor of Technology (Cosmetics)
14) Bachelor of Engineering (Part Time) (Civil)

Environmental Studies shall be a compulsory subject for IIIrd & IVth Semester of the following Bachelor Degrees of the University:

1) Bachelor of Engineering
2) Bachelor of Textile
3) Bachelor of Technology (Chemical Technology)
4) Bachelor of Technology (Chemical Engineering)
5) Bachelor of Architecture, and

Environmental Studies shall be a compulsory subject for Vth & VIth Semester of the Degree of Bachelor of Laws (Five Year Course)

Students admitted to Second Year/Third Year/IVth Semester Vth Semester of various degree examination courses in different faculties n the academic session 2005-06 or thereafter shall have to appear for examination in the subject Environmental studies.

The main Examination leading to Environmental Studies shall be held in Summer and Supplementary examination in Winter every year, at such places and on such date as may be appointed by the Board of Examinations.

Examination shall be conducted on the basis of one common question paper for all Bachelor Degree examination courses irrespective of annual or semester pattern.

Scope of the subject for annual pattern examination and or semester pattern examination shall be as provided under the syllabus.

Common question paper for all courses covered under this Ordinance alongwith answer books shall be supplied by the University to the Colleges, Departments and Institutes for conducting the examination of the subject.

Valuation of the answer books relating to this subject shall be done at College/Department/Institution level only. Remuneration for valuation of answer books shall not be paid by the University.

Provided that prescribed evaluation fee for evaluation of each answer Book/s of an external examinee/s appeared from the examination centre shall be paid to each examination centre.

It shall be obligatory on the part of the College/Department/Institute to submit candidate wise following information to the University on or before the date as may be prescribed by the University:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Grade/Category</th>
<th>Marks secured</th>
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<tbody>
<tr>
<td>1.</td>
<td>&quot;A&quot;</td>
<td>- 60 and above</td>
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<tr>
<td>2.</td>
<td>&quot;B&quot;</td>
<td>- 45 to 59</td>
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<tr>
<td>3.</td>
<td>&quot;C&quot;</td>
<td>- 35 to 44</td>
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<tr>
<td>4.</td>
<td>&quot;D&quot;</td>
<td>- 25 to 34</td>
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<tr>
<td>5.</td>
<td>&quot;Fail&quot;</td>
<td>- 24 and below</td>
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<tr>
<td>6.</td>
<td>&quot;Absent&quot;</td>
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</tbody>
</table>

For the purposes of teaching, learning and examination, the Committee consisting of three teachers shall be appointed by the Principal/Head of the Department/Head of the Institution under his/her Chairmanship/Chairpersonship. While appointing three teachers on the said committee, the Principal shall take care that the teachers to be appointed on the committee, if necessary, shall be from different faculty.

Duration of theory examination of this subject shall be three hour.

For all Bachelor Degree examinations, common question paper of 100 marks shall be provided by the University.

Distribution of these 100 marks shall be as follows:

a) Part-A, Short Answer Pattern - 25 Marks
b) Part-B, Essay type with inbuilt choice - 50 Marks
c) Part-C, Essay on Field Work - 25 Marks
14. Medium of instruction shall be English or Marathi or Hindi. Question paper shall be supplied in English and Marathi and Hindi. A candidate shall have option to write answers in English or Marathi or Hindi.

15. Examination for the subject Environmental Studies shall be compulsory for external candidates appearing as a fresh candidate at Winter and/or Summer examination.

16. For teaching of the subject, there shall be atleast two hour per week. For teaching the subject to the regular candidates, a full time approved teacher of the University and or a person having Postgraduate Degree in any faculty with second class shall be considered eligible.

17. For teaching of the subject, additional fee to be charged to regular candidate shall be as prescribed by the University.

18. Every College/University Teaching Department shall charge additional fee of Rs. 100/- to every student of the subject Environmental Studies. Out of this Rs. 100/-, the College/University Teaching Department shall have to pay Rs. 25/- to the University as an examination fee of each candidate for the subject Environmental Studies.

19. The Grade secured by an examinee in the examination of this subject shall not be considered for providing the facility of A.T.K.T. in next higher class.

20. The provisions of Ordinance No. 18/2001 shall not be applicable for securing a grade or higher grade in the examination of this subject.

21. Result of the Final Year of the respective Degree shall not be declared of an examinee unless he/she secures any one of the grade in the examination of subject.

Provided an examinee admitted to Five Year LL.B. course desiring not to continue his/her education beyond Sixth Semester of the said course shall have to secure any one of the grade in the examination of the subject otherwise his/her result of Sixth Semester for awarding B.A. degree shall not be declared.

22. Certificates shall be issued to the successful examinees in the subject Environmental Studies, after the examination.

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DIRECTION

No.:5/2005. Date: 3/6/2005

Subject: Fees to be charged to the students of the subject Environmental Studies as a compulsory subject at Bachelor Degree level

Whereas the Academic Council in its meeting held on 24/8/2003, vide Item No. 65, considered the letter received from Dr. Narendra Jain, Joint Secretary, University Grants Commission, New Delhi, dtd. 31st July, 2003, along with a copy of “Six month module Syllabus for Environmental Studies for Undergraduate courses” of all branches of Higher Education and resolved to refer the letter along with module Syllabus to all faculties for their considerations and recommendations thereon. The Council further resolved that the said recommendations be placed before the joint meeting of the Deans for further recommendations to the Academic Council,

AND

Whereas the joint meeting of Deans of faculties under the Chairmanship of Hon’ble Vice-Chancellor held on 16th July, 2004 has considered the recommendations of the faculties in the University regarding “Six month module Syllabus for Environmental Studies for Undergraduate courses” and resolved to recommend the decisions taken by it in respect of the subject Environmental Studies to the Academic Council,

AND

Whereas Academic Council in its meeting held on 16-08-2004 on considering Item No. 46 on the Agenda, resolved to accept the minutes of the joint meeting of Deans of the faculties in the University,

AND

Whereas as per decision of the Academic Council, the subject Environmental Studies is to be appointed as a compulsory subject for the previous year of the Bachelor Degree from the Academic session 2005-2006 excluding the Bachelor Degrees in the faculty of Education and LL.B. Three Year Course,

AND

Whereas the Management Council in its meeting held on 21/05/2005, vide Item No.167 has accepted fees to be charged to the students of the subject Environmental Studies as a compulsory subject at Bachelor Degree level,
AND

Whereas the matter is required to be regulated by an Ordinance and making amendment in the existing Ordinance is time consuming process,

Now, therefore, I, Dr. S.N. Patil, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, do hereby issue the following direction:

1) This direction shall be called “Examination in Environmental Studies leading to Bachelor Degree, Direction, 2005”
2) This direction shall come into force from the date of its issuance.
3) Every College / University Teaching Department shall charge additional fee of Rs. 100/- to every student of the subject Environmental Studies. Out of this Rs. 100/-, the College / University Teaching Department shall have to pay Rs. 25/- to the University as an examination fee of each candidate for the subject Environmental Studies.
4) Answer books of external examinee shall be evaluated at the examination centre where the examinee has been examined for the subject Environmental Studies. Each examination centre shall be paid prescribed evaluation fee for evaluation of each answer book of external examinee appeared from that examination centre.

Sd/-
(Dr. S.N. Patil)

Amravati                Vice-Chancellor

Date :03/06/2005.

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