बिलासपुर विश्वविद्यालय, बिलासपुर (छ.ग.)

पाठ्यक्रम
SYLLABUS

सत्र: 2017-18

बी.एस.सी. भाग-2
B.Sc. PART-2
# INDEX

1. Revised Ordinance No. - 3
2. Scheme of Examination - 5
3. Foundation Course - 7
4. Chemistry - 8
5. Physics - 16
6. Mathematics - 21
7. Botany - 24
8. Zoology - 27
9. Microbiology - 29
10. Geology - 31
11. Anthropology - 34
12. Statistics - 37
13. Defence Study - 39
14. Industrial Chemistry - 42
15. Electronic Equipment - 45
16. Computer Science - 49
17. Electronics - 52
18. Information Technology - 54
19. Industrial Microbiology - 56
20. Bio Chemistry - 58
21. Biotechnology - 61

---
PT. RAVISHANKAR SHUKLA UNIVERSITY RAIPUR (C.G.)

REVISED ORDINANCE NO. 21

BACHELOR OF SCIENCE

1. The three year course has been broken up into three Parts. Part-I known as B.Sc. Part-I examination at the end of the first year, Part-II known as B.Sc. Part-II examination at the end of the second year and Part-III known as B.Sc. Part-III examination at the end of the third year.

2. A candidate who after passing (10+2) Higher Secondary or Intermediate examination of C.G. Board of Secondary Education Bhopal or any other Examination recognised by the University or C.G. Board of Secondary Education as equivalent thereto, has attended a regular course of study in an affiliated College or in the Teaching Department of the University for one academic year shall be eligible for appearing at the B.Sc. Part-I examination.

3. A candidate who, after passing the B.Sc.-I examination of the University or any other examination recognised by the University as equivalent thereto, has attended a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-II examination.

4. A candidate who, after passing the B.Sc. Part-II examination of the University, has completed a regular course of study for one academic year in an affiliated college or in the Teaching Department of the University shall be eligible for appearing at the B.Sc. Part-III examination.

5. Besides regular students, subject to their compliance with this Ordinance ex-student and non-collegiate candidates shall be permitted to offer only such subjects/papers as are taught to the regular student at any of the University Teaching Department or College.

6. Every candidate appearing in B.Sc. Part-I, Part-II and Part-III examination shall be examined in -

(i) Foundation Course :

(ii) Any one of the following combinations of three subjects :-

1. Physics, Chemistry & Mathematics.
3. Chemistry, Physics & Geology.
4. Chemistry, Botany & Geology.
5. Chemistry, Zoology & Geology.
7. Chemistry, Mathematics & Geology.
13. Physics, Chemistry & Statistics.
22. Anthropology, Mathematics & Statistics
24. Zoology, Botany & Anthropology
25. Physics, Mathematics & Electronics.
26. Physics, Mathematics & Computer Application
27. Chemistry, Mathematics & Computer Application
28. Chemistry, Bio-Chemistry & Pharmacy
30. Chemistry, Zoology & Agriculture
31. Chemistry, Zoology & Sericulture
32. Chemistry, Botany & Environmental Biology
33. Chemistry, Botany & Microbiology
34. Chemistry, Zoology & Microbiology
35. Chemistry, Industrial Chemistry & Mathematics
36. Chemistry, Industrial Chemistry & Zoology
37. Chemistry, Biochemistry, Botany
38. Chemistry, Biochemistry, Zoology
39. Chemistry, Biochemistry, Microbiology
40. Chemistry, Biotechnology, Botany
41. Chemistry, Biotechnology, Zoology
42. Geology, Chemistry & Geography
43. Geology, Mathematics & Geography
44. Mathematics, Physics & Geography
45. Chemistry, Botany & Geography

(iii) Practical in case prescribed for core subjects.

7. Any candidate who has passed the B.Sc. examination of the University shall be allowed to present himself for examination in any of the additional subjects prescribed for the B.Sc. examination and not taken by him at the degree examination. Such candidate will have to first appear and pass the B.Sc. Part-I examination in the subjects which he proposes to offer and then the B.Sc. Part-II and Part-III examination in the same subject. Successful candidates will be given a certificate to that effect.

8. In order to pass at any part of the three year degree course examination an examinee must obtain not less than 33% of the total marks in each subject/ group of subjects. In subject/ group of subjects where both theory and practical examination are provided an examinee must pass in both theory and practical parts of the examination separately.

9. Candidate will have to pass separately at the Part-I, Part-II and Part-III examinations. No division shall be assigned on the result of the Part-I and Part-II examination. In determining the division of the final examination, total marks obtained by the examinees in their Part-I, Part-II and Part-III examination in the aggregate shall be taken in to account. Provided in case of candidate who has passed the examination through supplementary examination having failed in one subject/ group only, the total aggregate marks being carried over for determining the division shall include actual marks obtained in the subject/ group in which he appeared at the supplementary examination.
10. Successful examinee at the Part-III examination obtaining 60% or more marks shall be places in the First Division, those obtaining less than 60% but not less than 45% marks in the Second Division and other successful examinees in the Third Division.

In clause 6(ii) after serial No. 41, 42-45 inserted. Approved in 23rd Co-Ordination committee
Dated 15-01-2014.

D:\back\shital\Univ. Adhiniyam\RSU ORDINANCE\21 ORDINANCE 21.doc
## Scheme of Examination

<table>
<thead>
<tr>
<th>Subject</th>
<th>Paper</th>
<th>max. Marks</th>
<th>Total Marks</th>
<th>Min. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Environmental Studies</td>
<td>75</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Field Work</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Foundation Course

| Hindi Language | I 75 | 75 | 26 |
| English Language | I 75 | 75 | 26 |

*Note: प्रत्येक खंड में से 2 (दो) प्रश्न हल करने होंगे। सभी प्रश्न समान अंक के होंगे।*

### Three Elective Subject:

1. **Physics**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 33

2. **Chemistry**
   - I 33
   - I 33
   - III 34
   - Practical 50
   - 17

3. **Mathematics**
   - I 50
   - I 50
   - III 50
   - 150
   - 50

4. **Botany**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 33

5. **Zoology**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 33

6. **Geology**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 33

7. **Statistics**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 33

8. **Anthropology**
   - I 50
   - I 50
   - Practical 50
   - 100
   - 50
<table>
<thead>
<tr>
<th>Subject</th>
<th>Paper</th>
<th>max. Marks</th>
<th>Total Marks</th>
<th>Min. Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. Defence Studies</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Micro Biology</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Computer Sciences</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Information Technology</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Industrial Chemistry</td>
<td>I 34</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>III 33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Bio Chemistry</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Bio Technology</td>
<td>I 50</td>
<td>100</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I 50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Practical 50</td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**USE OF CALCULATORS**

The Students of Degree/P.G. Classes will be permitted to use of Calculators in the examination hall from annual 1986 examination on the following conditions as per decision of the standing committee of the Academic Council at its meeting held on 31-1-1986.

1. Student will bring their own Calculators.
2. Calculators will not be provided either by the University or examination centres.
3. Calculators with, memory and following variables be permitted +, -, x, , square, reciprocal, exponential, log, square root, trigonometric functions, wize, sine, cosine, tangent etc. factorial summation, xy, yx and in the light of objective approval of merits and demerits of the viva only will be allowed.
The question paper for B.A./B.Sc./B.Com./B.H.Sc., English Language and cultural valuators shall comprise the following units:

UNIT-I Short answer questions to be asked by (Five short answer questions of three marks each) 15 Marks

UNIT-II (a) Reading comprehension of an unseen passage 05 Marks
(b) Vocabulary

UNIT-III Report-Writing 10 Marks

UNIT-IV Expansion of an idea 10 Marks

UNIT-V Grammar and Vocabulary based on the prescribed text book. 20+15 Marks

Note: Question on all the units shall asked from the prescribed text which will comprise specimens of popular creative/writing and the following it any

(a) Matter & technology
   - State of matter and its structure
   - Technology (Electronics Communication, Space Science)

(b) Our Scientists & Institutions

(c) Indian Scientific Institutions (Ancient & Modern)

Books Prescribed:
Foundation English for U.G. Second Yaer - Published by M.P. Hindi Granth Academy, Bhopal.
NEW CURRICULUM OF B.SC. PART II
CHEMISTRY

The new curriculum will comprise of three papers of 33, 33 & 34 marks each and practical work of 50 marks. The curriculum is to be completed in 180 working days as per the UGC norms & conforming to the directives of the Govt. of Chhattisgarh. The Theory papers are of 60 hrs. each duration & the practical work of 180 hrs. duration.

PAPER - I
INORGANIC CHEMISTRY M.M. 33
(Paper Code - 0845)

UNIT-I CHEMISTRY OF ELEMENTS OF FIRST TRANSITION SERIES
Characteristic properties of d-block elements. Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

UNIT-II CHEMISTRY OF ELEMENTS OF SECOND & THIRD TRANSITION SERIES
General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

UNIT-III A. OXIDATION AND REDUCTION

B. COORDINATION COMPOUNDS
Werner’s coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valency bond theory of transition metal complexes.

UNIT-IV A. CHEMISTRY OF LANTHANIDE ELEMENTS
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

B. CHEMISTRY OF ACTINIDES
General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from uranium, similarities between the later actinides and the later lanthanides.

UNIT-V A. ACID AND BASES
Arrhenius, Bronsted-Lowry, the Lux-flood, solvent system and Lewis concepts of acids and bases.

N. NON-AQUEOUS SOLVENTS 06 HRS.
Physical properties of a solvent, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid ammonia and liquid sulphur dioxide.

REFERENCE BOOKS :
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
6. Inorganic Chemistry. A.G. Sharp, ELBS.
10. Advanced Inorganic Chemistry, Purl & Sharma, S. Naginchand
11. Inorganic Chemistry, Madan, S, Chand
15. Selected topic in Inorganic Chemistry by Madan Malik, & Tuli, S. Chand.

PAPER - II

ORGANIC CHEMISTRY 60 Hrs. MM. 33
(Paper Code - 0846)

UNIT-I  ALCOHOLS
A. Dihydric alcohols - nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage \([\text{Pb(OAc)}_4 \text{ and HIO}_4]\) and pinacol - pinacolone rearrangement.
B. Trihydric alcohols - nomenclature and methods of formation, chemical reactions of glycerol.

PHENOLS
A. Structure and bonding, in phenols, physical properties and acidic character. Comparative acidic strength of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols, acylation and carboxylation.

EPOXIDES

UNIT-II  ALDEHYDES AND KETONES
A. Nomenclature and Structure of the carbonyls group. Synthesis of aldehydes and ketones using 1,3 - dithiane, synthesis of ketones from nitriles.
Mechanism of nucleophilic additions to carbonyls group Benzoin, Aldol, Perkin and Knoevenagel condensations. Condensations with ammonia and its derivatives, Wittig reaction, Mannich reaction.
B. Use of acetate as protecting group, Oxidation of aldehydes, Baeyer - Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen Condensation, Wolff-Kishner reaction, LiAlH₄ and NaBH₄ reduction. Halogenation of enolizable ketones.

An introduction to α,β unsaturated aldehydes and ketones.

UNIT-III

A. CARBOXYLIC ACIDS


B. SUBSTITUTED CARBOXYLIC ACIDS

Hydroxy and Halo-substituted Acids.

C. CARBOXYLIC ACID DERIVATIVES

Structure of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Mechanisms of acid and base catalyzed esterification and hydrolysis.

UNIT-IV ORGANIC COMPOUNDS OF NITROGEN


UNIT-V HETEROCYCLIC COMPOUNDS

A. Introduction

Molecular orbital picture and aromatic character of pyrrole, furan, thiophene and pyridine, methods of synthesis and chemical reactions with emphasis on the mechanism of electrophilic substitution. Mechanism and nucleophilic substitution reaction in pyridine derivatives. Comparison of basicity of pyridine, Piperidine and pyrrole.

B. Preparation and reaction of Indole, quinoline and isoquinoline and with special reference to Fisher Indole synthesis and skraup synthesis and Bishop-Napieralski synthesis, Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.
Amino acids and Peptides:

A. Classification, Structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reaction of amino acids.

B. Structure and nomenclature of peptides. Peptide synthesis, solid-phase peptide synthesis.

REFERENCE BOOKS:
8. Organic Chemistry, Bahi & Bahl
10. Carbanic Rasayan, Bashi & Bahi
12. Carbanic Rasayan, Joginder Singh

PAPER - III

PHYSICAL CHEMISTRY 60 Hrs M.M. 34
(Paper Code - 0847)

UNIT-I A. Thermodynamics - I 12 Hrs.

Fundamental of thermodynamics system, surroundings etc. Types of systems, intensive and extensive properties, state and path functions thermodynamic operations Internal energy, enthalpy, Heat capacity of gases at constant volume and at constant pressure and their relationship.

First Law of Thermodynamics limitation of first law. Joule-Thompson expansion, inversion temperature of gases. Calculation of \( w, q, dU & dH \) for the liquefaction expansion of ideal gases under isothermal and adiabatic conditions.

B. Thermochemistry


UNIT-II A. Thermodynamics-II


Concept of entropy : entropy change in a reversible and irreversible process, Entropy change in isothermal reversible expansion of an ideal gas, Entropy
change in isothermal mixing of ideal gases, physical signification of entropy.

B. Gibbs and Helmholtz free energy variation of G and A with pressure, volume temperature, Gibbs Helmholtz equation.

UNIT-III  PHASE EQUILIBRIUM

A. Gibbs Phase rule, Phase components and degree of freedom, Limitation of phase rule.

Applications of phase rule to one component system - water system, sulphur system.

Application of phase rule to two component systems: pb-Ag system, Zn, Mg system, ferric chloride-water system, desilverization of congruent and incongruent, melting point, eutectic point.

Three component systems: solid solution liquid pairs.

Liquid liquid mixture: (Partially miscible liquids): phenol-water, trimethylamine-water nicotine systems, constant temperature, azeotrops.

B. Nerst distribution law, Henry's law, application, solvent extraction.

UNIT-IV  ELECTROCHEMISTRY-I

A. Electrolytic Conductance: Specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, kohlrausches law; application of kohlrausches law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titration.

B. Theories of strong electrolytes, limitations of ostwald dilution law, weak and strong electrolyte, Debye-Huckel-Onsager (DHO) equation for strong electrolyte, relaxation and electrophoretic effect.

C. Migration of ions: Transport number, definition and determination by Hittorf method and moving boundary method.

UNIT-V  ELECTROCHEMISTRY-II

A. Electrochemical cell or Galvanic cell: reversible and irreversible cells conventional representation of electrochemical cells, EMF of the cell, effect of temperature on EMF of the cell, Nernst equation, calculation of $\Delta G$, $\Delta H$ and $S$ for cell reaction.

B. Single electrode potential: standard hydrogen electrode, calomel electrode quinhydrone electrode, redox electrodes, electrochemical series.

C. Concentration cells with & without transport, liquid junction potential, application of concentration cell in determining valency of ions, solubility product, activity coefficient.


REFERENCE BOOKS :
4. The elements of Physical Chemistry, Eastern.
7. Physical Chemistry, Puri & Sharma
10. Bhoutic Rasayan, Bahl & Tuli

**PAPER - IV**

**LABORATORY COURSE**

**180 Hrs.**

**Inorganic Chemistry**

Calibration of fractional weights, pipettes and burettes. Preparation of standard solutions, Dilution-0.1 M to 0.01 M. solutions.

**Quantitative Analysis**

Volumetric Analysis
(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content-antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
(d) Estimation of hardness of water by EDTA.
(e) Estimation of ferrous & ferric by dichromate method.
(f) Estimation of copper using thiosulphate.

**Instrumentation**

Colorimetry
(a) Job's method
(b) Mole-ratio method
   Adulteration-Food Stuffs.
   Effluent analysis, water analysis

**Solvent Extraction**

Separation and estimation of Mg (H) and Fe (H).

**Ion Exchange Method**

Separation and estimation of Mg (H) and Zn (H).

**Organic Chemistry**

Laboratory Techniques

**A. Thin layer Chromatography**

Determination of Rr values and identification of organic compounds.
(a) Separation of green leaf pigments (spinach leave may be used)
(b) Preparation and separation of 2, 4-dinitrophenyl hydrazones of acetone, 2-butanol, hexan-2 and 3-one using toluene and light petroleum (40:60)
(c) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).
B  Paper Chromatography : Ascending & Circular.
Determination of R, values and identification of organic compounds.
(a) Separation of mixture of phenylalanine and glycine. Alanine and aspartic acid, Leucine and glutamic acid, Spray reagent-ninhydrin.
(c) Separation of monosaccharides- a mixture of D-galactose and d-fructose using n-butanol : acetone : water (4:5:1), Spray reagent-aniline hydrogen phthalate.

Qualitative Analysis
Identification of an organic compound through the functional group analysis, determination of M.Pt. and preparation of derivatives. (Aliphatic and Aromatic)

Physical Chemistry

Transition Temperature
Determination of the transition temperature of the given substance by thermometric/ dialometric method (e.g. MnCl₂. 4H₂O/SrBr₂.2H₂O).

PHASE EQUILIBRIUM
1. To study the effect of asolute (e.g. NaCl, Succinic acid) on the critical solution temperature of two partially miscible liquide (e.g. Phenol-water system and to determine the concentration of that solute in the fiven phenol-water system.
2. To construct the phase diagram of two component system (e.g. diphenylamine-benzophenone) by cooling curve method.

THERMO CHEMISTRY
1. To determine the solubility of benzoic acid at different temperatures and to determine H of the dissolution process.
2. To determine the enthalpy of neutralisation of a weak acid / weak base versus strong base / strong acid and determine the enthalpy of ionisation of the weak acid weak base.
3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chlofide from ite enthaply data using Born Haber cycle.

Reference Book -
1. Vogel's qualitative Analysis, revised Svehla, Orient Longman.
Three Experiments are to be Performed.

1. Inorganic - One experiment from synthesis and analysis by preparing the standard solution to be given. 12 marks

OR One Experiment from instrumentation either by colorimetry / solvent extraction/ion exchange method.

2. (a) Identification of the given organic compound & determine its M.Pt./B.Pt. 6 marks
    (b) Determination of $R_f$ value and identification of organic compounds by paper chromatography. 6 marks

3. Any one physical experiment that can be completed in two hours including calculations. 12 marks

4. Viva 10 marks

5. Sessional 04 marks

In case of Ex-Students one marks will be added to each of the experiments.
PHYSICS

Objectives:

Present course is aimed to provide ample knowledge of basics of physics which are relevant to the understanding of modern trends in higher physics.

The first paper is aimed at preparing the background of thermodynamics and statistical physics essential for any advanced study of physics of condensed matter and radiations.

The second paper is mainly concerned with a course on geometrical and Physical optics and the Laser Physics. It deals with important phenomenon like interference, diffraction and polarization with stress on the basic nature of light. It also introduces the basics of laser physics with some of its important applications.

The experiments are based mostly on the contents of the theory papers so as to provide comprehensive insight of the subject.

Scheme of Examination:

1. There shall be two theory papers of 3 hours duration each and one practical paper of 4 hours duration. Each paper shall carry 50 marks.
2. Each theory paper will comprise of 5 units. Two questions will be set from each unit and the student will have the choice to answer one out of two.
3. Numerical problems of about 30 percent will compulsorily be asked in each theory paper.
4. In practical paper each students has to perform experiments during examination.
5. Practical examination will be of 4 hours duration. The distribution of practical marks will be as follows:
   Experiments: 15 + 15 = 30
   Viva-Voce: 10
   Internal Assessment: 10

PAPER - I

THERMODYNAMICS, KINETIC THEORY AND STATISTICAL PHYSICS
(Paper Code - 0843)

UNIT-I

The laws of thermodynamics: The Zeroth law, concept of path function and point function, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, cantot theorem and the second law of thermodynamics. Different versions of the second law. Claussius theorem inequality. Entropy, Change of entropy in simple cases (i) Isothermal expansion of an ideal gas (ii) Reversible isochoric process (iii) Free adiabatic expansion of an ideal gas. Entropy of the universe. Principle of increase of entropy. The thermodynamic scale of temperature, its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics.

UNIT-II

Thermodynamic relationships: Thermodynamic variables, extensive and intensive, Maxwell's general relationships, application to Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waals gas, Clausius-Clapeyron heat equation.
Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures. Blackbody radiation: Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, Special distribution of BB radiation, Wien's displacement law, Rayleigh-Jean's law, the ultraviolet catastrophe, Planck's quantum postulates, Planck's law, complete fit with experiment.

UNIT-III
Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler broadening of spectral lines.

Transport phenomena in gases: Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.


UNIT-IV
The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibb's ensemble, accessible and inaccessible states. Concept of phase space, canonical phase space, Gamma phase space and mu phase space. Equilibrium before two systems in thermal contact, probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy. Transition to quantum statistics: 'h' as a natural constant and its implications, cases of particle in a one-dimensional box and one-dimensional harmonic oscillator.

UNIT-V

TEXT AND REFERENCE BOOKS:
1. B.B. Laud, "Introduction to Statistical Mechanics" (Macmillan 1981)
5. Physics (Part-2) : Editor, Prof : B.P. Chandra, M.P. Hindi Granth Academy.

PAPER - II
WAVES, ACOUSTICS AND OPTICS
(Paper Code - 0844)

UNIT-I
Waves in media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical

Harmonics and the quality of sound; examples. Production and detection of ultrasonic and infrasonic waves and applications.

Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection & refraction at a boundary, impedance matching for transducers, diffraction of sound, principle of a sonar system, sound ranging.

UNIT-II
Fermat's Principle of extremum path, the aplanatic points of a sphere and other applications.

Cardinal points of an optical system, thick lens and lens combinations. Lagrange equation of magnification, telescopic combinations, telephoto lenses.

Monochromatic aberrations and their reductions; aspherical mirrors and schmidt corrector plates, aplanatic points, oil immersion objectives, meniscus lens.

Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces. (Ramsdon and Rygen's eyepieces)

UNIT-III

UNIT-IV
Fresnel half-period zones, plates, straight edge, rectilinear propagation, Fraunhofer diffraction: Diffraction at a slit, half-period zones, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems.

Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating and blazed gratings, Concave grating and different mountings, resolving power of a grating and comparison with resolving powers of prism and of a Fabry-Perot etalon.

Double refraction and optical rotation: Refraction in uniaxial crystals, Phase retardation plates, double image prism. Rotation of plane of polarisation, origin of optical rotation in liquids and in crystals.

UNIT-V
Laser system: Purity of a spectral line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion, Types of Laser: Ruby and, He-Ne and Semiconductor lasers.

Application of lasers: Application in communication, Holography and non linear optics. (Polarization P including higher order terms in E and generation of harmonics).

TEXT AND REFERENCE BOOKS:
1. A.K. Ghatak, 'Physical Optics'
2. D.P. Khandelwal, 'Optical and Atomic Physics' (Himalaya Publishing House, Bombay,
3. K.D. Moltev; 'Optics' (Oxford University Press)
4. Sears: 'Optics'
5. Jenkins and White: 'Fundamental of Optics' (McGraw-Hill)
7. Smith and Thomson: 'Optics' (John Wiley and Sons)
8. Berkely Physics Courses: Vol.-III, 'Waves and Oscilations'
11. Text Book of Optics: B.K. Mathur

PRACTICALS

Minimum 16 (Sixteen) out of the following or similar experiments of equal standard.
1. Study of Brownian motion
2. Study of adiabatic expansion or a gas.
3. Study of conversion of mechanical energy into heat.
5. Study of temperature dependence of total radiation.
7. Resistance thermometry.
8. Thermoeemf thermometry.
10. Experimental study of probability distribution for a two-option system using a coloured dice.
11. Study of statistical distributions on nuclear disintegration data (GM Counter used as a black box)
12. Speed of waves on a stretched string.
13. Studies on torsional waves in a lumped system.
14. Study of interference with two coherent sources of sound.
15. Chlandi's figures with varying excitation and loading points.
16. Measurement of sound intensities with different situation.
17. Characteristics of a microphone-loudspeaker system.
18. Designing an optical viewing system.
20. Determining the principal points of a combination of lenses.

B.Sc.-II (19)
21. Study of interference of light (biprism or wedge film)
22. Study of diffraction at a straight edge or a single slit.
23. Study of F-P elaton fringes.
25. Resolving limit of a telescope system.
26. Polarization of light by reflection; also cos-squared law.
27. Study of Optical rotation for any systems.
28. Study of laser as a monochromator coherent source.
29. Study of divergence of a laser beam.
30. Calculation of days between two dates of a year.
31. To check if triangle exists and the type of the triangle.
32. To find the sum of the sine and cosine series and print out the curve.
33. To solve simultaneous equations by elimination method.
34. To prepare a mark-list of polynomials.
35. Fitting a straight line or a simple curve to a given data.
36. Convert a given integer into binary and octal systems and vice-versa.
37. Inverse of a matrix.
38. Spiral array.

**TEXT AND REFERENCE BOOKS:**

D.P. Khandelwal : "Optics and Atomic Physics" (Himalaya Publishing House, Bombay 1988)

D.P. Khandelwal : "A Laboratory Manual for Undergraduate Classes" (Vani Publishing House, New Delhi)


C. Dixon : "Numerical Analysis".
MATHEMATICS

There shall be three compulsory papers. Each paper of 50 marks is divided into five units and each unit carry equal marks.

PAPER - I
ADVANCED CALCULUS

(Paper Code - 0848)


UNIT-II Continuity, Sequential continuity, Properties of continuous functions, Uniform continuity, Chain rule of differentiability, Mean value theorems and their geometrical interpretations. Darboux's intermediate value theorem for derivatives Taylor's theorem with various forms of remainders.

UNIT-III Limit and continuity of functions of two variables, Partial differentiation Change of variables, Euler's theorem on homogeneous functions, Taylor's theorem for functions of two variables, Jacobians.

UNIT-IV Envelopes, Evolutes, Maxima, minima and saddle points of functions, two variables, Lagrange's multiplier method.

UNIT-V Beta and Gamma functions, Double and triple integrals, Dirichlet's integrals, Change of order of integration in double integrals.

REFERENCES:


PAPER - II

DIFFERENTIAL EQUATIONS

(Paper Code - 0849)


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.

UNIT-IV Partial differential equations of second and higher orders, Classification of linear partial differential equations of second order, Homogeneous and non-homogeneous equations with constant coefficients, Partial differential equations reducible to equations with constant coefficients, Monge's methods.

UNIT-V Calculus of Variations - Variational problems with fixed boundaries- Biler's equation for functionals containing first order derivative and one independent variable, Externals, Functionals dependent on higher order derivatives, Functionals dependent on more than one independent variable, Variational problems in parametric form, invariance of Biler's equation undercoordinates transformation.

Variational Problems with Moving Boundaries - Functionals dependent on one and two functions, One sided variations.

Sufficient conditions for an Extremum - Jacobi and Legendre conditions, Second Variation, Variational principle of least action.

REFERENCES:


PAPER - III
MECHANICS
(Paper Code - 0850)

STATICS

UNIT-I Analytical conditions of Equilibrium, Stable and unstable equilibrium, virtual work, Catenary.
UNIT-II Forces in three dimensions, Poinsot's central axis, Null lines and planes, Dynamics.
UNIT-III Simple harmonic motion, Elastic strings, velocities and accelerations along radial and transverse directions, Projectile, Central orbits.
UNIT-IV Kepler's laws of motion, velocities and acceleration in tangential and normal directions, motion on smooth and rough plane curves.
UNIT-V Motion in a resisting medium, motion of particles of varying mass, motion of a particle in three dimensions, acceleration in terms of different co-ordinate systems.

REFERENCES :
BOTANY

PAPER - I

DIVERSITY OF SEED PLANTS AND THEIR SYSTEMATICS

(Paper Code - 0861)

M.M. : 50

UNIT-I. 1. Characteristics of seed plants ; evolution of the seed habit ; seed plants with (angiosperms) and without (gymnosperms) fruits ; fossil and living seed plants.
2. General features of gymnosperms and their classification ; evolution and diversity of gymnosperms ; geological time scale, fossilization and fossil gymnosperms.

UNIT-II 3. Morphology of vegetative and reproductive parts ; anatomy of roots, stem and leaf, reproduction and life cycle of Pinus, Cycas and Ephedra.

5. Angiosperms taxonomy : brief history, aims and fundamental components; identification, keys taxonomic literature.
6. Botanical nomenclature : Principles and rules; taxonomic ranks; type concept; principle of priority.

UNIT-IV 7. Classification of angiosperms ; salient features of the systems proposed by Bentham and Hooker and Engler and Prantl.
8. Major contributions of cytology, phytochemistry and taximetrics to taxonomy.


PAPER - II

STRUCTURE DEVELOPMENT AND REPRODUCTION

IN FLOWERING PLANTS

(Paper Code - 0962)

M.M. 50

UNIT-I. 1. The basic body plan of a flowering plant : modular type of growth.
2. Diversity in plant form in annuals, biennials and perennials ; convergence of evolution of tree habit in gymnosperms, monocotyledons and dicotyledons ; trees-largest and longest-lived organisms.

UNIT-II 3. The shoot system : the shoot apical meristem and its histological organization ; vascularization of primary shoot in monocotyledons and dicotyledons ; formation of internodes, branching pattern ; monopodial and sympodial growth ; canopy architecture ; cambium and its functions ; formation of secondary xylem, a general account of wood structure in relation to conduction of water and minerals ; characteristics of growth rings, sapwood and heart wood ; role of woody skeleton ; secondary phloem - structure-function relationships, periderm.

UNIT-III 4. Leaf : origin, development, arrangement and diversity in size and shape ; internal structure in relation to photosynthesis and water loss ; adaptations to water stress ; senescence and abscission.
5. The root system : the root apical meristem ; differentiation of primary and secondary tissues and their roles ; structural modification for storage, respiration, reproduction and for interaction with microbes.
UNIT-IV 6. Flower: a modified shoot; structure, development and varieties of flower, functions, structure of anther and pistil, the male and female gametophytes; types of pollination; attractions and rewards for pollinators; pollen-pistil interaction, self incompatibility, double fertilization, formation of seed-endosperm and embryo; fruit development and maturation.

UNIT-V 7. Significance of seed: suspended animation; ecological adaptation; unit of genetic recombination and replenishment, dispersal strategies.

PRACTICAL SCHEME
Time: 4 Hrs. M.M.: 50
1. Plant Description 08
2. Gymnosperm 07
3. Anatomy 07
4. Embryology 04
5. Spotting (1-5 Spots) 10
6. Field Report 04
(Local Flora: Rainy/Winter/Summer Season)
7. Viva-Voce 05
8. Sessional 05
Total Marks: 50

BOTANY (PRACTICAL)
SUGGESTED LABORATORY EXERCISES

ANGIOSPERMS
The following species are suitable for study. This list is only indicative. Teachers may select plants available in their locality.
1. Ranunculaceae: Ranunculus, Delphinium
2. Brassicaceae: Brassica, Alyssum, Iberis, Coronopus
3. Malvaceae: Hibiscus, Abutilon
4. Rutaceae: Murraya, Citrus
5. Fabaceae: Faboideae: Lathyrus, Cajanus, Melilotus, Trigonella, Caesalpinioidae; Cassia, Caesalpinia; Mimosoideae; Prosopis, Mimosa, Acacia.
6. Apiaceae: Coriandrum, Poiniculum, Anethum
7. Acanthaceae: Adhatoda, Peristrophe
8. Apocynaceae: Vinca, Thevetia, Nerium
9. Asclepiadaceae: Calotropis
10. Solanaceae: Solanum, Withania, Datura
11. Euphorbiaceae: Euphorbia, Phyllanthus
12. Lamiaceae: Ocimum, Salvia
13. Chenopodiaceae: Chenopodium, Beta
14. Liliaceae: Asphodelus, Asparagus
15. Poaceae: Avena, Triticum, Hordeum, Poa, Sorghum

GYMNOSPERMS

CYCAS
1. Habit, armour of leaf bases on the stem (if specimen is not available show photograph), very young leaf (circinate vernation) and old foliage leaves, scale leaf, bulbils, male cone (specimen), microsporophyll, megasporeophyll, mature seed.

B.Sc.-II (25)
i. Study through permanent slides - normal root (T.S.), stem (T.S.) (if sections are not available show photographs), ovule (L.S.).

ii. Study through hand sections or dissections - coralloid root (T.S.), rachis (T.S.), leaflet (V.S.), microsporophyll (V.S.), pollen grains (W.M.).

**PINUS**

i. Habit, long and dwarf shoot showing cataphylls and scale leaves, T.S. wood showing growth rings, male cone, 1st year, 2nd year female cones, winged seed.

ii. Study through permanent slides - root (T.S.), female cone (L.S.), ovule (L.S.), embryo (W.M.) showing polycotyledonous condition.

Study through hand sections or dissections - young stem (T.S.), old stem (wood) (T.L.S. and R.L.S.), needle (T.S.), male cone (L.S.), male cone (T.S.), pollen grains (W.M.).

**EPHEDRA**

i. Habit and structure of whole male and female cones.

ii. Permanent slides - female cone (L.S.)

iii. Hand sections/dissections-node (L.S.), internode (T.S.), macerated stem to see vessel structure, epidermal peel mount of vegetative parts to study stomata, male cone (T.S. and L.S.), pollen grains.

**SUGGESTED LABORATORY EXERCISES**

Embryology, Anatomy and Vegetative Propogation etc.

1. Study of commonly occuring dicotyledonous plant (for example Solanum nigrum or Kalanchoe) to understand the body plan and modular type of growth.

2. Life forms exhibited by flowering plants (by a visit to a forest or a garden), study of tree like habit in cycads, bamboos, banana, traveller's tree (Ravenala madagasariensis) or yucca and comparison with true trees as exemplified by conifers and dicotyledons.

3. L.S. shoot tip to study the cytobhistological zonation and origin of leaf primordia.

4. Monopodial and Sympodial types of branching in stems (especially rhizomes).

5. Anatomy of primary and secondary growth in monocots and dicots using hand sections (or prepared slides), structure of secondary phloem and xylem, Growth rings in wood, Microscopic study of wood in T.S., T.L.S. and R.L.S.

6. Field study of diversity in leaf shape, size, thickness, surface properties, internal structure of leaf, structure and development of stomata (using epidermal peels of leaf).


8. Examination of a wide range of flowers available in the locality and methods of their pollination.

9. Structure of anther, microsporogenesis (using slides) and pollen grains (using whole mounts), pollen viability using in vitro pollen germination.

10. Structure of ovule and embryo sac development (using serial sections)

11. Test of self-incompatibility (using Petunia axillaris, Brassica campestris, B. olderacea or suitable available material) using field pollinations.

12. Nuclear and cellular endosperm, embryo development in monocots and dicots (using slides/dissections).

13. Simple experiments to show vegetative propagation (leaf cuttings in Bryophyllum, Sansevieria, Begonia, stem cuttings in rose, salix, money plant, sugarcane and Bougainvillea).


---
ZOOLOGY

PAPER - I

ANATOMY & PHYSIOLOGY

M.M. : 50

(Paper Code - 0863)

UNIT-I
Comparative Anatomy of various organ systems of vertebrates.
1. Integument and its derivatives : structure of scales, hair and feathers.
2. Alimentary canal and digestive glands in vertebrates.
3. Respiratory Organs
Gills and lung, Air-Sae in birds

UNIT-II
1. Endoskeleton-Limbs, girdles and vertebrae.
2. Circulatory System - Evolution of heart and aortic arches.

UNIT-III
1. Nervous System - General plan of brain and spinal cord.
2. Endocrine glands - classification and histology.
3. Gonads and genital ducts.

UNIT-IV
1. Digestion and absorption of dietary components.
2. Physiology of heart, Cardiac cycle and ECG.
4. Respiration-Mechanism and control of breathing.

UNIT-V
1. Excretion-Physiology of excretion, Osmoregulation.
2. Physiology of Muscle contraction.
3. Physiology of nerve impulse, Synaptic transmission.
4. Ear and Eye - structure and function.

LIST OF RECOMMENDED BOOKS :
2. Gaviong : Review of Medical Physiology.
4. Hildbrand : Analysis of Vertebrate structure
5. Kingsley : Outlines of Comparative Anatomy (Central Book Depot)
6. Rouer & Parsons : The Vertebrate Body, (Saunders)
7. Walta & Gyles : Biology of the Vertebrates (Macmillan)

PAPER - II

VERTEBRATE ENDOCRINOLOGY, REPRODUCTIVE BIOLOGY BEHAVIOUR, EVOLUTION AND APPLIED ZOOLOGY

(Paper Code - 0864)

UNIT-I
1. General Characters of Hormones.
2. Hormone Receptor
3. Biosynthesis and secretion of thyroid, Adrenal ; Ovarian and testicular hormones.
4. Endocrine disorder due to hormones and other gland.

UNIT-II
1. Reproductive cycle in vertebrate.
4. Hormonal regulation of gametogenesis.
5. Extra embryonic membrane.
UNIT-III
1. Evidences of organic evolution.
2. Theories of organic evolution.
3. Variation, Mutation, Isolation and Natural selection.
4. Evolution of Horse.

UNIT-IV
1. Introduction to Ethology.
2. Patterns of Behaviour Taxes, Reflexes, Drives and Stereotyped Behaviour.
3. Reproductive Behavioural Patterns.
4. Hormones, Drugs and Behaviour.

UNIT-V
1. Aquaculture
2. Sericultural
3. Apiculture
4. Pisciculture
5. Poultry keeping
6. Elements of Pest Control -
   1. Chemical control
   2. Biological Control

PRACTICAL WORK
The practical work in general shall be based on the syllabus prescribed in theory. The students will be required to show the knowledge of the following.
1. Study of the representative examples of the different chordates (Classification and character)
2. Dissection of various systems of scoliodon-Afferent and Efferent branchial vessels, cranial nerves, internal ear.
3. Simple microscopic technique through unstained or stained permanent mounts.
4. Study of prepared slides histological, as per theory papers.
5. Study of limb girdles and vertebrae of frog, varanus, fowl and Rabbit.
6. Identification of species and individuals of honey bee.
7. Life cycle of honey bee and silkworm.

PRACTICAL WORK - DISTRIBUTION OF MARKS
1. Major dissection 12
   (Cranial nerves/ Efferent branchial vessel)
2. Minor dissection (Afferent branchial/ Internal ear) 08
3. Permanent mount 09
4. Spotting-8 (Slides-4, bones-2, specimens-2) 16
5. Viva 05
6. Sessional marks Total: 50
MICROBIOLOGY
B.SC. PART II
SCHEME OF EXAMINATION

Paper - Title
First - Microbial Physiology and Genetics 50
Second - Principles of Bioinstrumentation and Techniques 50
Practical - 50
Total : 150

PAPER - I
MICROBIAL PHYSIOLOGY AND GENETICS
(Paper Code - 0869) M.M. : 50

UNIT-I Plasma membrane and transport across membrane, Energy transformation, Physiology of bacterial growth, phases of growth, growth conditions, differentiation in bacterial cells-sporulation, germination; bacterial cell division replication of chromosome, partition of chromosome into daughter cell.

UNIT-II Primary and Secondary metabolism.

UNIT-III Bacterial plasmids; structure and properties, replication, incompatibility, plasmid amplification.
Bacteriophages; lytic development cycle - T4; lytic and lysogenic development of phage, single stranded DNA phage.
Transposition; Structure of bacterial transposons, types of bacterial transposons. Mechanism of antibiotic resistance and spread of antibiotic resistance.

UNIT-IV Genetic recombination; requirements, molecular basis, genetic analysis of recombination in bacteria.

UNIT-V DNA Repair and restriction; Types of repair systems, restriction endonuclease, various types of restriction enzymes, dam and dcm methylases.

Text Book:
2. General Microbiology by Power and Daganiwala.

PAPER II
PRINCIPLES OF BIOMEDICAL AND TECHNIQUES
(Paper Code - 0870) M.M. : 50

UNIT-I Colorimetry and spectrophotometry.
Spectrofluorimetry, turbidimetry, nephelometry, luminometry.
pH metery.

UNIT-II Chromatography; adsorption partition, column, gas, ion-exchange, gel filtration, and affinity, Chromatography, HPLC, FPLC.

UNIT-III Centrifugation and ultra centrifugation.
Microscopy- light, phase-contrast, fluorescence, dark field, electron microscopy.
Laser, confocal, microscopy and digital image analysis
UNIT-IV Tissue culture techniques; Principal and requirements of animal tissue culture, Decontamination, sterilization and disinfection.

UNIT-V Electrophoresis techniques- types and their application; Electrophoresis of proteins and nucleic acids. Immunoelectrophoresis
Sequencing of proteins and nucleic acids.
Radioisotope techniques; nature of radioactivity, detection measurement, counter, safety aspects.
Enzyme purification and assay techniques.

Text Books:
1. Introduction to Instrumental analysis by Robert Braun.
2. Instrumental Techniques by Upadhyay and Upadhyay.
3. Instrumental Methods of Chemical Analysis by BK Sharma.

PRACTICAL

Determination of growth phase of E.coli by measurement of OD and colony forming units.
Relationship between OD and CFU measurements.
Measurement of growth by dry weight and wet weight - Penicillium spp.
Determination of antibiotic resistance by plating method.
Assaying of microbial enzymes; Catalase, Proteases, Peroxidases, Cellulase, Cellobioases, Amylase, Diastase.
Exercise on colourimeter/spectrophotometer/pH meter.
Exercise on paper, thin layer, column chromatography.
Exercise on paper and gel electrophoresis.
Exercise on tissue culture techniques.
Absorbance curve for dyes.
Testing of Beer’s law

SCHEME OF PRACTICAL

<table>
<thead>
<tr>
<th>Time - 4 hours</th>
<th>M.M.: 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Exercise on spectrophotometry / colorimetry / pH meter</td>
<td>08</td>
</tr>
<tr>
<td>2. Exercise on Chromatography / Electrophoresis</td>
<td>07</td>
</tr>
<tr>
<td>3. Measurement of microbial growth / microbial Enzymes / antibiotic sensitivity test</td>
<td>10</td>
</tr>
<tr>
<td>4. Spotting (1-5)</td>
<td>10</td>
</tr>
<tr>
<td>3. Viva-Voce</td>
<td>05</td>
</tr>
<tr>
<td>4. Sessional</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

B.Sc.-II (30)
विषय - भू-विज्ञान

सैद्धांतिक प्रश्न पत्र - 1

भू-गतिकी एवं संरचनात्मक भू-विज्ञान

पूर्णांक - 50

( पेपर कोड - 0851 )

इकाई-1
1. पुस्तक की भू-भौतिकी स्थिति : गृहस्थ, चुम्बकीयता तथा पुराचुम्बकीयता।
2. समस्यात्मक की अवधारणारूप सिद्धांत।
3. पवित्रक एवं महादेशभवनी गतिविधियों। बौद्धिक पवित्रनिमाणकारी गतिविधियों।
4. पवित्रनिमाणकारी, कायानामण, चुम्बकल एवं धातुनिमाणकारी में अन्तरसंबंध।
5. माहात्म्यविश्वासन एवं समुद्रतलविस्तार के साथ एवं सिद्धांत।

इकाई-2
1. मध्य समुद्री यात्रा, बाह्य, द्वीपीयचारनों को उपयुक्त, वितरण एवं महत्व।
2. प्लेट-विवृत्तिको के सिद्धांत। प्लेट सीमाओं की प्रकृति एवं प्रकार।
3. समुद्रों एवं महादेशों का उद्विकास।
4. माहात्म्यविश्वासनी सीमाओं की विवृत्तिकी : माहात्म्यविश्वासनी शैल्प, अपराधित-टैड, अक्रियत एवं सीमात्मक शृंखलाय।
5. वनविवृत्तिकी : संक्रामण, भू-आकृतिक संस्करण, अवशेषपरिवर्तन, पुनरुत्पादन भूमण्डल।

इकाई-3
1. विविधविवृत्तियाँ का अभिनिधारण एवं भू-वैज्ञानिक महत्व।
2. वलन आकर्षिती एवं न्यायनित वर्गीकरण।
3. वलन का जननक वर्गीकरण।
4. वलन का वार्तीकी एवं कारण।
5. मानचित्र एवं स्थल में वलनों का अभिनिधारण। वलन का दस्तांश पर प्रभाव।

इकाई-4
1. भूग साधन एवं जननी वर्गीकरण।
2. भूग का दस्तांशों पर प्रभाव।
3. रंगों : न्यायनित एवं जननी वर्गीकरण। लक्षण-गुमल।
4. प्राण : वर्गनिमाण शैलविखन, उपरत एवं दीर्घ संस्करणों से सम्बन्ध।
5. रेखां : वर्गनिमाण शैलविखन, प्रकार एवं उपरत तथा दीर्घ संस्करणों से संबंध।

इकाई-5
1. प्राथमिक आधार एवं अवसादी संस्करणों के आवार पर अभि एवं शृंखल का अभिनिधारण।
2. शैल वर्गीकरण का प्रारंभिक जानकारियों। प्रतिलोक एवं विकृति की अवधारणा। प्रतिलोक एवं विकृति दौरान दृष्टिकृत।
3. भूमण्डलित की मूलभूत जानकारियों।
4. गोतियोग्राफिक प्रक्रिया एवं संरचनात्मक भू-विज्ञान में अनुप्रयोग।
5. भूत की विवृत्तिकी संरचना।

REFERENCE :
7. Patwardhan, A.. 1999 : The Dynamic Earth system - Practice Hall
10. बलिदान, ख. सिंह, 1997: सामाजिक भू-विज्ञान, कुछ उच्चतंत समस्याओं, उ.प. हिंदी अकादमी, लखनऊ।

BOOKS RECOMMENDED:
6. संरचनात्मक भूविज्ञान : एस.डी. के. श्रीवासव, म.प. हिंदी, अकादमी भोपाल
7. भाष मिश्र गंडी - संरचनात्मक भू-विज्ञान : म.प. हिंदी अकादमी, भोपाल

सैद्धांतिक प्रश्न पत्र - 2
शैलिकी एवं भू-इतिहास पूर्णांक -50
(पेपर कोड - 0852)

इकाइ-1
1. दिक्रकाल में शैल-संगठन । शैल ग्रंथियों की अवधारणा, तंत्र-प्रावश्च एवं पृथक।
2. समस्यावश्च - उपमातिकों के मूल सिद्धान्त । द्वि-विषयमित्रीय सिद्धांत तंत्र में प्रावश्च साम्य (एल्बाइट-एल्बाइट)। (डायोपाइड एल्बाइट) (डायोपाइड-एल्बाइट-एल्बाइट)
3. आपूर्ति आपूर्ति शैलों का शिलाविलिकरण अध्ययन।
4. शारीरिक एवं अल्पविलिक आपूर्ति शैलों का शिलाविलिकरण अध्ययन।
5. आपूर्तिविलिक आपूर्ति शैलों का शिलाविलिकरण अध्ययन।

इकाइ-2
1. कायात्मक प्रक्रियाओं की साम्य एवं आध्यात्मिक अभिन्नताएँ।
2. पेशेवरिक आरोप : प्रवेशिय कीवलशेष, ए.सी.एफ. एवं ए.के.एफ. आरोप।
3. ताप-द्रव-संगठन के संरचन में ग्रृहमय शैलों का उद्विकास।
4. ताप-द्रव-संगठन के संरचन में अल्पविलिक तथा चुंबायत क्षैरों का उद्विकास।
5. अपूर्तिक प्रक्रियाओं की सामायिकताएँ : स्थलबन्ध एवं सामायिक अवसासों का प्रस्थापन।

इकाइ-3
1. वायुक्ष, जलक्ष, तंत्रीय एवं गंधिर मुलकुल्य क्षेत्रधिक नवाचार की गतिक।
2. अवसासी एवं प्रतिविनिधुल संत्त्रणों की अवधारणयय।
3. पृथ्वीविलिक एवं गृहज्ञाता विवेकशेष के मूलभूत सिद्धान्त।
4. संस्तरविलिक गतिकरण एवं सहसंबंध।
5. प्रतिविनिधानी अक्रिय एवं गतिकरण की विधियाँ : प्रतिविनिधानी संस्थापन एवं विषय विनायक का अभिनिधारण।

इकाइ-4
वायुक्ष, भौगोलिक वितरण, शैलक्षीय तकनीक, संचरकृत जीवविद्या तथा आधुनिक महत्त्व निमित्त विज्ञानमुद्दों का-
1. धारावाह, सिंहभुम, बंसर, अरक्तर के महासंघ के पूर्व के क्रियायोग शैल।
2. सागर, कड़ुम, विन्ना, छतासागर महासंघ के पूर्व के क्रियायोग शैल।
3. साल्लैंतगेंग के पुरातनी शैल एवं गाँडवाना महासंघ।
4. सिङ्गह, कपड़ा, विनायकपोल के महाजीविय महाकल्पिन्य शैल, डेक्कन ट्रेश और अंतर्ज्ञात संस्कृत।
5. आसाम के तृतीय शैल एवं विशालकाय संचं। हिम, नदीय युग, हिम, नदीय युगों के कारण, एवं हिम-नदी रिश्ता।
प्रायोगिक

1. प्राकृतिक स्थूलदारी नमूनों एवं कृत्रिम संरचनात्मक प्रादर्शों में संरचनाओं का सांचा वर्णन।
2. भू-वैज्ञानिक नक्शों में परिच्छेदिक, भू-वैज्ञानिक काट की रचना एवं निर्मित।
3. संरचनात्मक आंकड़ों के लिये रिटर्नोग्राफिक प्रक्षेपण की निर्मित।
4. स्थलाकृतिक मानचित्रों से आकार मित्रता संशोधन।
5. सैद्धांतिक पात्रम प्रांत में शामिल जीवाश्म संग्रहों के प्रमुख जीवाश्मों की आवश्यक की अध्ययन।
6. भारत के मानचित्र पर मुख्य रूप से वैज्ञानिक एवं शैलवित्तचनक इकाई का विवरण दर्शान।
7. मुख्य आवेदन, अवसादी एवं कायान्तरित शैलों के स्थूलदारी नमूनों का अध्ययन।
8. मुख्य आवेदन, अवसादी एवं कायान्तरित शैलों के काटों का सुश्रुषदारी अध्ययन।

भू-वैज्ञानिक श्रेणीय अध्ययन:
10 दिवसीय भू-वैज्ञानिक मानचित्रण कार्य एवं आर्थिक खनिज निक्षेपों का अध्ययन।
नमूना संग्रहण (अयस्क, शैल, जीवाश्मों के रूप में) एवं उनका विशेष अध्ययन।

BOOKS RECOMMENDED : FOR PAPER II
2. Best, M.G. 1986 - Igneous Petrology - CBS Publication
4. Sengupta, S. 1997 - Introduction to sedimentology-oxford-IBH
7. Ravindra Kumar - Statigraphi of India
8. S. Anantharaman - Palaeontology

B.Sc. -II (33)
ANTHROPOLOGY

PAPER - I

ARCHAEOLOGICAL ANTHROPOLOGY

(Paper Code - 0865)

AIM : The main aim of this course is to introduce the students about the basic elements of Prehistoric Archaeology.

UNIT-I Meaning and scope of the different kinds of Archaeology: Classical Archaeology, Historical Archaeology, Prehistoric Archaeology and Protohistoric Archaeology as Anthropology, Differences between the Old world and New world Dating, Archgeology Traditions. Absolute Dating Relation Dating..

UNIT-II Geological time scale. The Great Ice Age. Stratigraphy and other evidences of Ice Age: River terraces, Moraines etc. Alpine and Himalayan glaciations. Pluvials and interpluvials, Stone Age tools: Types and Technology.


UNIT-V Metal Age: Copper, Bronze and Iron age General feature of Urban revolution. The Chief characteristics and the decay of Indus valley civilization. Megalithic culture in India.

RECOMMENDED READINGS:

1. Auchin, B. and Alliche R. (1968) : The birth of Indian Civilization
2. Rodier, F. (1970) : The Old Stone Age
6. Oakley, K.P. (1972) : Man the Tool maker
7. Shaprio, H.L. (Editor) : Man Culture and Society
9. Misra, V.N. & M.S. Mate (eds) : Indian Prehistory: 1964
10. Sankalia, H.D. : Prehistory and Portohistory of Indian & Pakistan
13. मनुष्य की जान की तथा शरणजी : प्रागैतिहासिक
14. जीवन में समय : पुरातात्विक मानवविज्ञान
PAPER - II

TRIBAL CULTURE OF INDIA

(Paper Code - 0866)

AIM :
The main aim of this course is to introduce the students about the basic-cultural life of Indian tribes.

UNIT-I
Define tribe and scheduled tribe, Geographical distribution of Indian tribes and their social and linguistic classification. Anthropological contribution in the study of Indian tribes. Sacred complex, Universalisation and parochialisation, Sanskritisation and westernisation dominant caste. Tribe & caste difference between S.C. and S.T. characteristic features. Primitive tribes of Chhattisgarh (Kamar, Birhor, Hill Korwa, Abujmarh, Balsa)

UNIT-II
Tribal economy: Hunting, food gathering, fishing, shifting and settled agriculture of property and ownership in tribal societies, problems of tribal people: land alienation, bonded labour, indebtedness, shifting, cultivation, irrigation, forest and tribals, unemployment, agricultural labour, the inter relationship of tribals with agricultural merchants, money lenders, excise officers and forest contractors, stage of tribal economy.

UNIT-III
The problems of culture contact: problems due to urbanisation and industrialisation, regionalism economic and psychological folk traditions, tribal religion: origin & function, animistic, totemistic, concept and practices: Magic and witchcraft, shamanism, head hunting.

UNIT-IV
Political and social organisation of Indian tribes: Political organisation of Indian tribes, Distinction between state and stateless society, law in primitive society, matriarchal and patriarchal family, lineage and clan. Ways of acquiring mates in tribal societies. Youth dormitories: Type, organisation and functions.

UNIT-V
Tribal development: History of tribal development, the constitutional safeguards for the scheduled tribes, tribal problem: isolation, migration, acculturation, detribalizations, policies, plans and programmes of tribal development and their implements, tribal revolts in India, Response of the tribal people to the Governmental measures meant for them, the role of anthropology in tribal development.

PAPER - III

PRACTICAL

OBJECTIVES
The objective of this practical course is to introduce the students with the primitive material culture and technology used by primitive man and the students will be introduced with various techniques commonly used by social anthropology.

MATERIAL CULTURE :

PART-I
Identification and technological descriptions of the following.
1. Implements for food gathering, hunting, fishing and agriculture.
2. Five making implements.
3. Types of habitations
4. Land and water transport

**PART-II** Sketching, identification and the description of palaeolithic, mesolithic and neolithic tools.

(It is essential that students should draw at least five tools of each age)

**RESEARCH TOOLS:**

Construction of schedules, Genealogy and Questionnaire:

Each student should collect information through above tools from 05 Repodents.

The student will be required to maintain practical records of all work done in the practical class.

**RECOMMENDED BOOKS:**

2. Leakey, L.S.B.: Adam's Ancestors
3. Sankalia, H.L.: Prehistoric tools and their techniques
4. Murdock, G.P.: Outlines of cultural material
5. Shapiro, H.L. (Editor): Man, culture and society (Eng. & Hindi)
6. जीवे, संस्कृत: पुरातत्त्विक मानव विज्ञान
7. विद्वान, विज्ञान: भौतिक-संस्कृति के आदित्य चरण

**RECOMMENDED READINGS:**

2. Bose, N.K.: Tribal life of India
3. Elwin, V.: A new deal of Tribal India
4. Fuchs, S.: The Aboriginal Tribes of India
5. Government of India: Adivasi
6. Ghurye, G.S.: The scheduled tribes
7. Mamvria: Tribal demography
8. Vidyaarthi, L.P.: The tribal culture of India
9. नवीम हसनेन: जनजातीय भाषा
10. Verma, R.C.: Indian tribes through ages
11. उपाध्याय तथा शर्मा: भारत की जनजाति संस्कृति
12. रिवाबी शिवकुमर: मध्यप्रदेश की जनजातियाँ
13. श्रीवास्तव, ए.आर.एन.: जनजाति विकास के चार दशक

---

B.Sc.-II (36)
STATISTICS
PAPER - I (Paper Code - 0853)

STATISTICAL METHODS


UNIT-II  Statistical Tests and Interval Estimation: Null and alternative hypotheses, Types of errors, p-values, Statement of chi-square, t, and F statistics. 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. Related confidence intervals. Testing for the significance of sample correlation coefficient in sampling from bivariate normal distribution and for the equality of means and equality of variances in sampling from bivariate normal distributions.


UNIT-IV  Nonparametric tests: Definition of order statistics and their distributions, Non-parametric tests, Sign test for univariate and bivariate distributions, Wilcoxon-Mann-Whitney test, Run test, Median test and Spearman's rank correlation test.

UNIT-V  Four short notes, one from each unit will be asked. Students have to answer any two.

REFERENCES -

ADDITIONAL REFERENCES -

PAPER - II (Paper Code - 0854)

A - SAMPLE SURVEYS

UNIT-I  Sample Surveys, Concepts of population and sample, need for sampling, Census
and sample survey, basic concepts in sampling, organizational aspects of survey sampling, sample selection and sample size.
Some basic sampling methods - simple random sampling (SRS) with and without replacement.

**UNIT-II**
Stratified random sampling, Systematic sampling, ratio and regression methods of estimation under SRS.
Non sampling errors, acquaintance with the working (questionnaires, sampling design, methods followed in field investigation, principal findings etc.) of NSSO, and other agencies undertaking sample surveys.

**B - ANALYSIS AND DESIGN OF EXPERIMENTS**

**UNIT-III**
Analysis of variance for one way and two-way classifications.
Need for design of experiments, fundamental principles of design, basic designs- CRD, RBD, LSD and their analysis.

**UNIT-IV**
Factorial designs - 2^n designs, illustrations, main effects and interaction effects and confounding in 2^3 design.

**UNIT-V**
Four short notes, one from each unit will be asked. Students have to answer any two.

**REFERENCES**

**ADDITIONAL REFERENCES**

**PRACTICAL**
1. Drawing random samples from standard univariate discrete and continuous distributions such as binomial, Poisson, Normal, Cauchy and Exponential.
3. Large sample tests for means and proportions, tests of goodness of fit and independence of attributes in contingency tables.
5. Analysis of variance for one-way and two-way classifications, Analysis of CRD, RBD, and LSD, Analysis of 2^2 and 2^3 factorial designs.
DEFENCE - STUDIES

PAPER - I

WESTERN MILITARY HISTORY

(Paper Code - 0867)

Note : The aim of this paper is to give a historical, political & social background of the state engaged in the conflicts under study and the factors influencing the development of different forms of warfare and weapons system.

Note : Question will be set from each unit there will be only Internal choice.

UNIT-I Age of Valour
1. Military System of Greek; Tactics of Phalanx.
2. Alexander the Great and his reforms.
3. Military system of Roman; Tactics of Legion, Julius Caesar.
4. Battle of Arbela 311 B.C.
5. Battle of Cannae 216 B.C.

UNIT-II Age of Chivalry
1. Emergence and decline of cavalry.
2. Battle of Adrianopole 378 A.D.
3. Battle of Hastings 1066 A.D.
4. Cavalry tactics of Zenghiz Khan.
5. Battle of Crece 1346 A.D.

UNIT-III Age of Gun Powder & Steam
1. Impact of Gun Powder in war.
2. Contribution of Gustavas adolphus & Fredrik the Great.
5. Napoleonic art of warfare and his military reforms.

UNIT-IV World War - I & II
1. First World War - Causes of W.W., Policies and Strategic plans of the powers.
5. Personalities of Rommel.

UNIT-V World War - II
1. Armament and Mechanical warfare with reference to the theories of J.F.C. Fuller and Liddell Hart.
2. Role of air power, weapons, doctrines, tactics.
3. Role of naval power, weapons, doctrine tactics.
4. Tactics of Second World War.
5. Advent of Nuclear weapons and their impact on warfare.

SELECTED READING:
1. Harkabi Y. : Nuclear war and Nuclear peace

PAPER-II
THEORY AND PRACTICE OF WAR
(Paper Code - 0868)

Aim: The aim of this paper it to acquaint the students with the concepts of theory and practice of war.

Note: Questions will be set from each unit and there will be only internal choice.

UNIT-I
4. Jomini - Concept of mass armies.

UNIT-II

UNIT-III
1. Mao Tse Tung.
2. Che Guevara.
3. Economic and Psychological war.

UNIT-IV
1. Indo-China War - 1962 Causes of war, political & military lesson.
2. Indo - Pak War - 1965 Causes of war, political & military lesson.
3. Indo - Pak War - 1971 Causes of war, political & military lesson.

UNIT-V
1. Internal & External threats of National Security.
2. Insurgency and Counter-Insurgency.
3. Terrorism - Problem and Solution.
4. Naxalism - Problem and solution.

REFERENCE BOOKS:
1. Howard M. : Theory and Practice of war
2. ---,--- : Clausewitz
3. Mao Tse Tung : Guerilla war fare
4. Palit, D.k. : The lightning War Tadit Yudh
5. Mankekar : War of 1971
PRACTICAL

There shall be a practical examination of 3.5 hours duration carrying 50 Marks. The division of marks shall be as follow:

(a) Exercise based on Map-reading : 15 marks
(b) T.W.E.S.T. : 15 marks
(c) Sessional work : 10 marks
(d) Viva-Voce : 10 marks

PART - A

Map-reading :
1. Scales - Definition, method of expressing, construction of simple, time, diagonal and comparative.
2. Relief and its representation.
3. Slopes and Gradient.
4. Visibility and inter-visibility by Gradient, proportionate and section method.
5. Re-section and inter-section.
6. Grid system-Map reference, Index to map. Four figure and Six figure.

PART - B

7. Organisation and equipment of infantry Platoon and Section.
8. Section Formation.
9. Indication of Target by various methods.
10. Fire control order.
11. Patrols.
13. Verbal Order.

BOOKS RECOMMENDED :

2. युद्ध स्थल कला : चौ. नरेन्द्र सिंह
3. एन.सी.सी. परिचय : विष्णु कान्त शर्मा
INDUSTRIAL CHEMISTRY

PAPER - I

Unit-I Material Science: Mechanical Properties of materials and change with respect to temperature. 02L

Material of constructions used in Industry:

Metals and Alloys: Important metals & alloys; iron, copper, aluminium lead, nickel, titanium and their alloys- Mechanical and chemical properties and their applications. 06L

Cement: Types of cement, composition, manufacturing process, setting of cement. 04L

Ceramic: Introduction, Types, Manufacturing process, Applications. Refractories. 04L

Unit-II Polymeric Materials: Industrial polymer and composite materials- Their constitution, Chemical and physical properties, Industrial applications. 06L

Unit-III Glass: Types, composition, manufacture, physical and chemical properties, Applications. 06L

Corrosion: Various types of corrosion relevant to chemical Industry-Mechanism, Preventive methods. 04L

Unit-IV Pollution: Air, Oxygen, nitrogen cycle, water, Biosphere, flora and fauna, Bacteries, soil. 05L

Pollutants and their statutory limits, pollution evaluation methods. 04L

Unit-V Air pollution-various pollutants. water pollution-organic/inorganic pollutants, Noise pollution, sewage analysis, pesticide pollution, Radiation pollution, green house effect, future. 10L

Books Recommended:
2. Pollution Control in Industries, A Series of Books by Jones, H.P.
3. Air Pollution - Vol.1 to 4, Editor, STEEN, A.C.; Academic Press.
7. Science of Ceramics, Stewarts, G.H.
8. Chemistry of Cement.
9. Properties of Glass, Morcy, G.W.
10. Chemistry of Glasses, Paul, A.
11. Corrosion, causes & Prevention, Spellur, F.N.

PAPER - II

Unit-I Unit processes in organic chemicals manufacture -

Nitration: Introduction - Nitrating agents, Kinetics and mechanism of nitration processes such as nitration of:

i. Paraffinic hydrocarbons
ii. Benzene to nitrobenzene and m-dinitrobenzene
iii. Chlorobenzene to o and p nitrochloro benzenes.
iv. Acetanilide to p-nitroacetanilide
v. Toluene

Continuous vs batch nitration.


UNIT-III Sulphonation: Introduction- Sulphonating agents, chemical and physical factors in sulphonation, Kinetics and mechanism of sulphonation reaction, commercial sulfonation of benzene, naphthalene, alkyl benzene, Batch vs continuous sulfonation.

UNIT-IV Effluent Treatment and Waste Management: Principles and equipments for aerobic, anaerobic treatment, absorption, filtration, sedimentation.

UNIT-V Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers, absorbers, solid waste management, industrial safety.

Books Recommended:
1. Unit process in Organic synthesis P.M. Groggnis, McGraw Hill.

PAPER - III

UNIT-I Oxidation: Introduction- Types of oxidation reactions, oxidizing agents, kinetics and mechanism of oxidation of organic compounds. Liquid phase oxidation, vapor phase oxidation, commercial manufacture of benzoic acid, maleic anhydride, phthalic anhydride, acrolein, acetaldehyde, acetic acid.

UNIT-II Hydrogenation: Introduction- Kinetics and thermo-dynamics of hydrogenation reactions, catalysts for hydrogenation reactions, hydrogenation of vegetable oil, manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acids and esters to alcohols, catalytic reforming.

UNIT-III Alkylation: Introduction; Types of alkylation, Alkylating agents, Thermodynamics and mechanism of alkylation reactions, manufacture of alkyl benzenes (for detergent manufacture), ethyl benzene, phenyl ethyl alcohol, N-alkyl anilines (mono and dimethyl anilines).

UNIT-IV Esterification: Introduction; Hydrodynamics and kinetics of esterification reactions, Esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivatives, commercial manufacture of ethyl acetate, diethylene phthalate, vinyl acetate, cellulose acetate.

UNIT-V Amination: (A) By reduction: Introduction, Methods of reduction-metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides. Sodium metal, concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitroaniline, p- amino phenol.

(B) By aminolysis: Introduction, aminating agents, factors affecting.

Hydrolysis: Introduction; hydrolysing agents, kinetics, thermodynamics and mechanism of hydrolysis.
UNIT-IV  
**Process Instrumentation** : concept of measurement and accuracy  
Principle, construction and working of following measuring instruments.  
- **Temperature** : Glass thermometers, bimetallic thermometer pressure spring thermometer, vapour filled thermometers resistance thermometers. radiation pyrometers.  
- **Pressure** : Manometers, barometers, bourdon pressure gauge ; bellow type, diaphragm type pressure gauges, macleod gauges, pirani gauges, etc.  

UNIT-V  
**Liquid level** : Direct-indirect liquid level measurement, Float type liquid level gauge, ultrasonic level gauges; bubbler system, density measurement, viscosity measurement.  

Books Recommended :  
1. Unit process in organic synthesis, P.M. Groggins, McGraw Hill.  
2. Industrial Instrumentation, Bekmen, D.P., John wleys.  

Time : 4 Hours  
**PRACTICALS**  
M.M. 50  
- **Unit Process** : One to two examples of each of the following unit processes.  
  - Nitration, sulphonation, friedel-crafts reaction, esterification, hydrolysis, oxidation, Halogenation, chloro-sulfonation, reduction, polymerization, reactions of diazonium salts.  
  - **Instrumental methods of analysis** : Use of colourimeter pH meter, potentiometer, conductometer, refractometer, polarimeter  
  - **Material testing** : Testing of alloys identification of plastics/rubber estimation of yield point, young’s modulus, flaredness; Optical, thermal mechanical and electrical properties.  
  - **Process Instrumentation** : Transducers of different types. use of Transducer for measuring flow control. Determination of flash point and ignition points of liquids.  
  - **Water analysis** : Solid contents, Hardness, COD and other tests as per industrial specifications.  
  - **Flow measuring devices** : Floats  
  - Monographs of representative raw materials such as sulphuric acid, toluene, sodium, carbonate, sodium hydroxide, carbon tetrachloride benzoic acid (5-6 compounds).  
  - Limit tests for heavy metals Pb, As, Hg, Fe and ash content.
VOCATIONAL COURSE IN ELECTRONIC EQUIPMENT MAINTENANCE

SCHEME OF EXAMINATION

Max. Marks Min. Pass Marks

| Paper - I | Operational Principles of Audio | 50 | 17 |
| Paper - II | Microprocessor Based Instrumentation and Control | 50 | 17 |
| Practical | 50 | 17 |

1 SUBJECT OBJECTIVE :

The objective of this syllabus is to familiarize students with the fundamentals of electronics and prepare him/her to keep track with fast change in this field so that he/she is prepared to take up advance studies or go for self employment. It is proposed to give the students an idea of basics of all the developments in the field of electronics. Efforts are directed to impart some knowledge of computer hardware and software too, which fall in the realm of electronics so that the students become aware of fast changing scene of information superhigh way also.

2 JOB POTENTIALS :

The students in (by) taking up this course may find adequate job opportunities in industries or manufacturing firms. They may opt for setting up their own small scale industries of electronics, thus enhancing self employment.

3 Contents :

As per attached syllabus.

4 Subject scheme.

5 On the job training will be imparted in Summer days.

6 As detailed out in the prospectus.

7 As per the draft given in the syllabus.

8 Permissible combination of subject Physics, Mathematics & Electronic equipment mathematics.

PAPER - I

(Paper Code - 0859)

OPERATIONAL PRINCIPLES OF AUDIO AND VIDEO EQUIPMENTS M.M. 50

UNIT-I Revision of All and FH, communication bands, signal sources, Basic Principles of propagation of e.m. wave through atmosphere and ionosphere; ground waves, sky waves, space waves, dead zones etc.

RECEIVING ANTENNAE : Antenna Parameters like gain, radiation pattern, effective aperture. Ferrite AE. Type of antennas like wire, loop, dish, Yagi, telescopic, their construction and operating principles.

SUPERHETERODYNE RECEIVERS : Principles, advantages, block diagram, RF input and AE coupling arrangements, RF amplifiers, mixer, local oscillator, IF amp. detector, audio amplifier, loud speaker, power requirements, tuning/aligning of receivers, waveforms and voltages at different check points. Circuit reading of various radio sets, repair and trouble shooting, automobile radios.
UNIT-II ELEMENTS OF A TELEVISION SYSTEM: Picture transmission, sound transmission, picture reception, sound reception, synchronisation.

TYPE VIDEO SIGNAL: Scanning sequence details, sync details of the 625 line system, channel bandwidth, vestigial sideband transmission, reception of vestigial sideband signals, frequency modulation, FM channel bandwidth, channel bandwidth for colour transmission, allocation of frequency bands for television bandwidth for colour transmission, allocation or frequency bands for television signal transmission, television standards.

Picture tubes- monochrome and colour: Beam deflection, face plate, picture tube characteristics, picture tube circuit controls.

UNIT-III TELEVISION RECEIVERS: Types of television receivers, receiver sections, video detector, video section fundamentals, video amplifiers-design principles, video amplifier circuits, automatic gain control and noise cancelling circuits, sync separation circuits, sync-processing and APC circuits, deflection circuits, sound system, RF tuner, video IF amplifiers, receiver power supplies, television receiver antennae, colour television antennae.

TELEVISION APPLICATIONS: Television broadcasting, cable television, closed circuit television, theatre television, picture phone and facsimile, video tape recording (VTR), television via satellite, TV games, HDTV, flat panel TV teleconferencing.

UNIT-IV TAPE RECORDERS: Principles of magnatic recording, characteristics of magnetism, the hysteris loop, recording head, recorded wave-length, response of head during reply, the effect of gap length, low frequency loss, other losses, equalization, the effect of non-linear characteristic of magnification recording bias, A.C. bias, erasing the tape, block diagram of audio tape recorder.

Oscillator, preamplifier, dolby, amplifier, record (play back) head, erase head, tapes (metal polymer), mechanical transport system, stereo recording, double deck, single deck, microphones (RF, Cable), noise, maintenance of mechanical parts, head cleaners, head alignment, graphic equalisers.

UNIT-V TELEPHONES: Modulation, demodulation, modem, subscriber frequency allotment, channel organisation, signalling, switching, manual exchanges, STD, ISD, E1, Intercom-stress on equipment and EPABX, Value added services like FAX E mail.

MEASURING INSTRUMENTS: Multimeters analog/digital, oscilloscopes, signal generators, noise and sound level meters, frequency counters, error sources and precautions during measurement.

GENERAL NOTE: Familiarisation with catalogues, standard specification, knowledge about companies referring to service manual.

PAPER - II

MICROPROCESSOR BASED INSTRUMENTATION AND CONTROL

(Paper Code - 0860)

M.M. 50

UNIT-I MICROCOMPUTER FUNDAMENTALS: Introduction, simplified microcomputer architecture, simplified memory organization, instruction set, simplified CPU

B.Sc.-II
organisation, microcomputer operation, Personal computer organization and Word Processor.

Data sheet descriptions, pin diagram and function, microprocessor architecture, using the data/address register, using the stack pointer.

**UNIT-II THE INTEL 8080/8085 MICROPROCESSOR :** Introduction, the 8085 pin diagram and functions, the 8085 architecture, addressing modes, the 8080/8085 instructions set, the 8080/8085 date transfer instructions, the 8080/8085 arithmatic instructions, the 8080/8085 logical instructions, the 8080/8085 stack, I/O, and machine control instructions.

**UNIT-III PROGRAMMING THE MICROPROCESSOR :** Machine and assembly languages, simplified instruction set, instruction set, arithmetic operations, instruction set-logical operations, instruction set-date transfer operations, instruction set branch operations, instruction set-subroutine all and return operations, instruction set-miscellaneous operations, writing a program, addressing modes, program branching, program looping using subroutines.

Programming the 8080/8085 microprocessor : Introduction, straight-line programs, looping programs, mathematical programs.

**UNIT-IV INTERFACING THE MICROPROCESSOR:** Introduction, interfacing with ROM, interfacing with RAM, input/output interfacing basics, interfacing with practical I/O ports, synchronizing I/O data transfers using interrupts, address decoding.

**UNIT-V Application to illustrate the use of microprocessor in :**

- Traffic control
- Temperature control
- Digital clock
- Stepper motor control
- Washing machine control

**PRACTICALS**

A student is required to do atleast 12 experiments in an academic year, and one month Summer Training. The scheme of practical examination will be as follows:

- One experiment of 3 hours duration and one Month Summer Training.

### Marks

<table>
<thead>
<tr>
<th>Experiment</th>
<th>25 Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sessional</td>
<td>10 Marks</td>
</tr>
<tr>
<td>One Month Summer Training</td>
<td>15 Marks</td>
</tr>
</tbody>
</table>

**Total 50 Marks**

* The marks for summer training will be awarded by the teachers teaching the students on the basis of the certificate issued by the external supervisor of the summer training.
LIST OF PRACTICALS

1. Development of soldering skill by constructing a few circuits and testing.
2. PCB making.
4. Study of oscillator.
5. Study of PA system and i.s. testing.
6. Tape recorder-testing, assembly and dis-assembly.
7. Radio receiver-testing.
8. Study of EPABK, wiring and connectivity with telephone instruments.
9. Familiarisation with 8085 Based microprocessor trainer kit. Location of 8085, 8279, 8253 keyboard, display fields, EPROM Programmer, expansion slot, TTY and serial lines.
10. Entering and executing an assembly language program, codes for insertion, deletion, memory move, block fill, setting and examining registers and memory, single step execution of a program.
11. Writing of a program to add, subtract and multiply two numbers stored in memory (nnnn & nnnn*1) and place the result in the subsequent memory, (nnn*2).
12. Writing of a program to test R.H. for errors by writing 0’s & 1’s in alternate location and reading it for checking.
13. Making of a board with a 3 LED’s and four switches to connect to the 8085 kit on the expansion slot (8279).
14. Making of a board with a 8 LED’s and four switches to connect to the 8-85 kit on the expansion slot (8255).
   (a) Program the 8255 to glow/switch of LED’s.
   (b) Program the 8255 to switch on and off the LED’s every few second according to a given pattern (Hint: The pattern can be 01010101 and 10101010 or 001001100, or any other).

Reference Books:

1. Fundamentals of acoustics : Kinsler & Frey
2. System trouble shooting : Lucces K, Paulken Berry
   Handbook (John Wiley & Sons)
3. Monochrom & Colour Television : P.R. Gulati
4. Television Engineering : Dhake
5. Microprocessor : Gaonkar
6. Microprocessor : B. Ram
7. Microprocessor : Shaum Saries
COMPUTER SCIENCE

PAPER - I

COMPUTER HARDWARE

(Paper Code - 0855)

Duration 3 hours                Max. Marks 50

AIM - The emphasis is on the designing concepts & organisational details of the common PC, leaving the complicated electronics of the system of the computer Engineers.

OBJECT OF THE COURSE -

1. To introduce the overall organisation of the microcomputers.
2. To introduce the common peripheral devices used in computers.
3. To introduce the hardware components, use of micro processor and function of various chips used in microcomputer.

N.B.: Since the computer organisation study is very vast & complicated, so the study is restricted to only the description and understanding part, hence the paper setter is requested to keep this important factor in mind.

UNIT-I  CLASSIFICATION AND ORGANIZATION OF COMPUTERS


UNIT-II  CENTRAL PROCESSING UNIT.

CPU organization, ALU control unit registers. Instructions for INTEL 8085, Instruction word size, Various addressing mode interrupts and exceptions, some special Control signals and I/O devices. Instruction cycle fetch and execute operation, time Diagram, data flow.

UNIT-III  MEMORY OF COMPUTERS.

Main memory secondary memory, backup memory, cache memory; real and virtual memory. Semiconductor memory. Memory controller and magnetic memory; RAM; disks, optical disks Magnetic bubble memory; DASD, destructive and non destructive. readout. Program of data Memory and MMU.

UNIT-IV  I/O DEVICES.

I/O devices of micro controller; processors. I/O devices, printer, plotter, other output devices, I/O port serial data transfer scheme, Micro controller, signal processor, I/O processor I/O processor arithmetic processor.

UNIT-V  SYSTEM SOFTWARE AND PROGRAMMING TECHNIQUE.

ML, AL, HLL, stac subroutine debugging of programs macro, micro programming, Program Design, software development, flow & chart multi programming, multiuser, multi tasking Protection, operating system and utility program, application package.
Recommended Books:
2. Computers Today - By Donal H. Sanders
4. IBM PC - XT Clones - By Govinda Rajalu

Paper - I

Software (Paper Code - 0856)

 AIM - Introduction to the web-language HTML & problem solving through the concept of object oriented programming.

OBJECT OF THE COURSE -
1. To introduce the internet & web related technology & learn the intricacies of web-page designing using HTML.
2. To introduce the object oriented programming concept using C++ language.
3. To introduce the problem solving methodology using the C++ programming features.

UNIT-I HTML BASICS & WEB SITE DESIGN PRINCIPLES
Concept of a Web Site, Web Standards, What is HTML? HTML Versions, Naming Scheme for HTML Documents, HTML document/file, HTML Editor, Explanation of the Structure of the homepage, Elements in HTML Documents, HTML Tags, Basic HTML Tags, Comment tag in HTML, Viewing the Source of a web page, How to download the web page source? XHTML, CSS, Extensible Markup Language (XML), Extensible Style sheet language (XSL), Some tips for designing web pages, HTML Document Structure. HTML Document Structure-Head Section, Illustration of Document Structure,  <BASE> Element, <ISINDEX> Element, <LINK> Element, <META> Element, <TITLE> Element, <SCRIPT> Element, Practical Applications, HTML Document Structure-Body Section-:Body elements and its attributes: Background; Background Color; Text; Link; Active Link (ALINK); Visited Link (VLINK); Left margin; Top margin, Organization of Elements in the BODY of the document: Text Block Elements; Text Emphasis Elements; Special Elements — Hypertext Anchors; Character-Level Elements; Character References, Text Block Elements: HR (Horizontal Line); Hn (Headings) ; P (Paragraph); Lists; ADDRESS; BLOCKQUOTE; TABLE; DIV (HTML 3.2 and up) ; PRE (Preformatted); FORM, Text Emphasis Elements, Special Elements — Hypertext Anchors, Character-Level Elements: line breaks (BR) and Images (IMG), Lists, ADDRESS Element, BLOCKQUOTE Element, TABLE Element, COMMENTS in HTML, CHARACTER Emphasis Modes, Logical & Physical Styles, Netscape, Microsoft and Advanced Standard Elements List, FONT, BASEFONT and CENTER.

UNIT-II IMAGE, INTERNAL AND EXTERNAL LINKING BETWEEN WEBPAGES
Netscape, Microsoft and Advanced Standard Elements List, FONT, BASEFONT and CENTER Insertion of images using the element IMG (Attributes: SRC (Source),

B.Sc.-II (50)
UNIT-III
INTRODUCTION TO OOP
Advantages of OOP, The Object Oriented Approach, Characteristics of object oriented languages- Object, Classes, Inheritance, Reusability, Polymorphism and C++.


UNIT-IV
OBJECT CLASSES AND INHERITANCE
Object and Class, Using the class, class constructor, class destructors, object as function argument, copy constructor, struct and classes, array as class member, Static Class Data, Static Member Functions, Friend function, Friend class, operator overloading, Type of inheritance, Base class, Derive class, Access Specifier: protected. Function Overriding, member function, String, Template Function.

UNIT-V
POINTERS AND VIRTUAL FUNCTION
pointers: & and * operator pointer variables, .pointer to pointer, void pointer, pointer and array, pointer and function, pointer and string, memory management, new and delete, pointer to object, this pointer Virtual Function: Virtual Function, Virtual member function, accesses with pointer, pure virtual function

File and Stream: C++ streams, C++ Manipulators, Stream class, string I/O, char I/O, Object I/O, I/O with multiple object, Disk I/O,

RECOMMENDED BOOKS:
1. Introduction to HTML : Kamlesh Agarwala, O.P.Vyas, Prateek A. Agrawala (Kitab Mahal Publication)
2. Let us C++ : Y. Kanetkar B.P.B Publication
3. Programming in C++ : E. Balaguruswami
4. Mastering in C++ : Venu Gopal
ELECTRONICS

PAPER - I (Paper Code - 0857)

DIGITAL ELECTRONICS

UNIT-I
Number Systems: Binary numbers, binary to decimal conversion, decimal to binary conversion, Binary additions, binary subtractions, L'S Complements, 2S Complements, binary multiplication and division, Octal and Hexadecimal numbers, BCD code and gray cone. Logic Gates: OR, AND, NOT NAND, NOR, X OR X-NOR gates, positive and negative logic, universal building blocks.

UNIT-II

UNIT-III
Arithmetic circuits: Half and full adders, half and full substractors, binary adders, 8421 adders, 2's complement adder Subractor.

UNIT-IV
Logic families: Various logic families RTL, DTL, TIL, ECL, MOS, I^2L, (MOS) and their characteristics, basic gates used in these families. Flip flop, D flip flop, JK flip flops, positive and negative edgetriggered flip flops, JK master slave vlip lop, idea of astable and monostable multivibrators.

UNIT-V

PAPER - II (Paper Code - 0858)

ELECTRONIC INSTRUMENTS

UNIT-I
Regulated Power Supplies: Power supply characteristics, Zener regulator, series voltage regulator, series regulator with pass transistor to large load currents, Shunt regulator, idea of Darlington pair, Regulator with Op-amp, inverting, non-inverting, Amplifiers, Zener reference, IC regulated circuits (IC 78XX series).

UNIT-II
CRO: Block diagram, basic operation, electro-static focussing, electrostatic deflection, screens for CRT, CRT circuits, Horizontal deflection system, Sweep generator, Synchronizing the wave, vertical deflection system, vertical amp., Lissajous figures, frequency and phase measurement, Introduction to storage CRO, dual trace dual beam, samp CRO.

UNIT-III
Signal Generators: Sweep frequency Gerenator, pulse and square wave generator, pulse characteristics and terminology, astable multivibrator, block diagram of pulse generation function, 555 timer for frequency generation, Blocking Oscillator wave generator, Introduction to IC 8038 as complete function generator.

UNIT-IV
O Meter: Basic circuit; Measuring methods, direct series and parallel connections, sources of errors, Electronic Voltmeter, D.C. Voltmeter direct coupled amp. and
Chopper type D.C. amp., A.C. Voltmeter, true RMS responding Voltmeter, multirange voltmeter sensitivity.
Power meter: Single phase, double phase and three phase Watt-meter Watt meter.
Digital Voltmeter: LED's digital display seven segment display, integrating DVM, Ramp DVM, Stair case Ramp, Successive approximation DVM, Sample and hold circuits.

UNIT-V

Analog/Digital Multimeter: Analog multimeter, AC and DC measurement, conversion of analog output to digital form (A/D), Dual ramp A/D converter, digital measuring system, multimeter block diagram, voltage, current and resistance measurements.
Frequency counter: Elements of electronic counter, decade counting assembly temperature compensated prystal oscillator, universal counter, measurement modes; frequency measurement, period measurement, time interval measurement, measurement errors: gating errors, time base error, trigger level error.

ELECTRONICS

PRACTICAL M.M. 50

Student is required to do at least 14 experiments in an academic year. --- setl---

of Practical examination will be as follows:

2. Verification of:
   1. Truth tables of basic logic gates. (ii) De Morgens theorem.
3. Study of Half adders and full adders using IC's.
4. Study of RS flip flops.
5. Study of JK Master slave flip flop.
6. Study of the decade counter and divided by N. circuits.
7. Study of D/A Converter.
9. Study of OP Amp: inverting and non inverting amplifiers of different gains.
10. Study of OP-Amp adder, subtractor, integrator and differentiator.
11. Study of IC regulated power supply.
13. Study of 8083 based function generator.
15. Data transfer from memory to register and vice versa using 8085 microprocessor.
16. Study of frequency by Wien's bridge.

Note: Other experiments of equal standard may also be set.

REFERENCES:
1. Microprocessor by Gaonkar
2. Electronic & Electrical Instruments by Sawhoe
3. Fundamental of Microprocessors by B. Ram
4. Digital Electronics by R.P. Jain
5. Digital Electronics by Flloyd
INFORMATION TECHNOLOGY

PAPER - I

DIGITAL CIRCUITS & COMPUTER H/W

(Paper Code - 0874)

UNIT-I
(A) Number Systems :
Octal and hexadecimal number, decimal rep., complements, addition, subtraction, multiplication, division, fixed point rep., floating point rep., other binary code: gray code, excess 3 gray, excess-3, 2421, etc. error detection code.

(B) Boolean Algebra :
Laws, demorgan's theorem, Simplification boolean expression & logic diagram, positive & negative logic, K-map and simplification of K-map.

UNIT-II
Combinational circuits :

UNIT-III
Multivibrator circuits :
Monostable, astable, bistable, smitt trigger, clocked RS, master-slave flip-flop, edge triggered flip-flop, latch.
Integrated circuits :
RTL, DITL, TTL, CMOS, MOS.

UNIT-IV
(A) Central Processing Unit :
Introduction, register organisation, stack organisation, Instruction formats, Addressing modes.

(B) I/O organisation :
I/O interfaces, Data transfer, types and modes, interrupts, DMA, IOP.

UNIT-V
Memory organisation :
Memory hierarchy, main memory, Auxiliary memory, Associative memory, cache memory, virtual memory, memory management techniques.

REFERENCE TEXT BOOK :
1. Integrated Electronics - Millman & Halkias
2. Principle of Electronics - V.K. Mehta
3. Digital Electronics - R.P. Jain
5. Digital Electronics & Computer Hardware - Morris Mano

PAPER - II

(Paper Code - 0875)

UNIT-I
Introduction to OPP : Advantages of OPP, the Object oriented approach, characteristics of object oriented languages: object, classes, inheritance, reusability, polymorphism and C++.
UNIT-II Function: function declaration, calling function, function definition, passing arguments to function, passing constant, passing value, reference argument, returning by reference, inline function, function overloading, default arguments in function.

UNIT-III Object and classes, using the classes, class constructor, class destructor, object as function argument, copy constructor, struct and classes, array as class member, static class data, static member functions, friend function, function overload, type of inheritance, base class derive class, access percifier, protected,

UNIT-IV Pointers: & and * operator pointer variables, pointer to pointer, void pointer, pointer and array, pointer and functions, pointer and string, memory management, new and delete, pointer to object, this pointer, virtual function: virtual function, virtual member function, accesses with pointer, pure virtual function.

UNIT-V File and stream: C++ streams, C++ manipulators, Stream class, string I/O, char I/O; object I/O, I/O with multiple objects, disk I/O.

REFERENCE TEXT BOOKS:
1. Programming in C++ - E. Balaguruswami
2. Mastering in C++ - Venu Gopal
3. Object Oriented Programming in C++ - Robert Lafore
4. Let us C++ - Y. Kanetkar

PRACTICAL WORK
1. The sufficient practical work should be done for understanding the paper.
2. At least five programs on each unit from unit 2 to unit 5 be prepared.
3. All practical works should be prepared in form of print outs and be evaluated while practical examination.

---
# INDUSTRIAL MICROBIOLOGY

<table>
<thead>
<tr>
<th>Paper</th>
<th>Title</th>
<th>Time</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>Environmental Microbiology and Biostatistics</td>
<td>3 hrs.</td>
<td>50</td>
</tr>
<tr>
<td>Second</td>
<td>Microbial Physiology and Immunobiotechnology</td>
<td>3 hrs.</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PRACTICAL Examination</td>
<td>4 hrs.</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>(including sessionals)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: During Two months Summer Vacation, students will visit some Industries. He/She will submit "Summer Job-Training Report" in B.Sc. IIrd Year Viva Voce Exam.

## PAPER - I

**ENVIRONMENTAL MICROBIOLOGY AND BIOSTATISTICS  M.M.50**

(Paper Code - 0876)

**UNIT-1**
- Our environment: Soil, water and air. Concept of environment in relation to microbes.

**UNIT-2**

**UNIT-3**
- Nitrogen fixation by symbiotic and non-symbiotic microorganisms. Use of microorganisms as biofertilizers. Mass cultivation of Rhizobium and Azotobacter. Use of blue-green algae as biofertilizers.

**UNIT-4**

**UNIT-5**
- Basic idea of probability, normal, binomial and poisson distribution. Mean, Mode and Median. Chi-Square test. Exponential and Logarithmic Functions.

## PRACTICALS

1. Isolation of Microorganisms from Air.
2. Isolation of Microorganisms from Water.
3. Isolation of Microorganisms from soil.
4. Determination of MPN of faecal contaminants in water.
5. Measurement & confirmation of E. coli in water sample.
7. Study of Rhizobium from root nodules.
8. Study of symbiotic and non-symbiotic blue-green algae.
9. Problems based on the determination of Mean, Median and Mode.
10. Problems on Chi-Square Test.
11. Experiments to demonstrate Symbiotic, Antagonistic activities and relations amongst microbes and their interactions with plants.

## RECOMMENDED BOOKS:

1. Introduction to Soil Microbiology by Martin Alexander.
2. General Microbiology by Pelczar, Reid & Chan.
UNIT-1 Diffusion, gaseous exchange, Osmosis, Plasmolysis, Biochemical properties of membranes, Passive and Active transport mechanism. Role of ionophores, group translocation across the membranes.


UNIT-3 Respiration mechanisms - Breakdown of carbohydrates through glycolysis, Kreb's cycle. Fermentation. Pentose Phosphate Pathway. Fermentation of alcohol, Citric acid and acetic acid.


UNIT-5 History and Scope of immunology, Types of immunity. Antigen-Antibody reactions. Immunoglobulins - Structure and functions. Production of Vaccines and Monoclonal antibodies.

PRACTICAL
1. Isolation of photosynthetic bacteria and cyanobacteria from soil.
2. Isolation and characterisation of Methanogens.
5. Study of nitrate and nitrite reduction by microorganisms.
7. Demonstration of plasmolysis, osmosis, active and passive transport mechanism.

BOOK RECOMMENDED:
3. Immunology by Davis.
4. Immunology by G.P. Talwar.
UNIT-I INTRODUCTION

History, general characteristics, nomenclature, IUB enzyme classification (rationale, overview and specific examples), significance of numbering system. Definitions with examples of holoenzyme, apoenzyme, coenzymes. Cofactors, activators, inhibitors, active site (identification of groups excluded), metallo-enzymes, units of enzyme activity, specific enzymes,Isoenzymes, monomeric enzymes, oligomeric enzymes and multi-enzyme complexes. Enzyme specificity.

Historical perspective, nature of non-enzymatic and enzymatic catalysis. Measurement and expression of enzyme activity-enzyme assays. Definition of IU, Katal, enzyme turn over number and specific activity. Role of non-protein organic molecules and inorganic ions coenzyme, prosthetic groups. Role of vitamins as coenzymes precursors (general treatment).

UNIT-II ENZYME CATALYSIS

Role of cofactors in enzyme catalysis : NAD/NADP+, FMN/FAD, coenzyme A, biocytin, cobamide, lipoamide, TPP, pyridoxal phosphate, tetrahydrofolate and metal ions with special emphasis on coenzyme functions. Acid-base catalysis, covalent, proximity and orientation effects, strain and distortion theory. Mechanism of action of chymotrypsin, carboxypeptidase, ribonuclease and lysozyme.

UNIT-III ENZYME PURIFICATION

Methods for isolation, purification and characterization of enzymes.

UNIT-IV ENZYME KINETICS


Kinetics of zero and first order reactions. Significance and evaluation of energy of activation and free energy.

Reversible and irreversible inhibition, competitive, non-competitive and uncompetitive inhibitions. determination of $K_m$ & $V_{max}$ in presence and absence of inhibitor. Allosteric enzymes.

UNIT-V INDUSTRIAL AND CLINICAL APPLICATION OF ENZYME

Immobilization of enzyme and their industrial applications. Production of glucose from starch, cellulose and dextran; use of lactase in dairy industry; production of glucose-fructose syrup from sucrose; use proteases in food, detergent and leather industry; medical application of enzymes. use of glucose oxidase in enzyme electrodes.
UNIT-I INTRODUCTION TO METABOLISM

General features of metabolism, experimental approaches to study metabolism; use of intact organism, bacterial mutants, tissue slices, stable and radioactive isotopes.

CARBOHYDRATE METABOLISM


UNIT-II ELECTRON TRANSPORT CHAIN AND OXIDATIVE PHOSPHORYLATION

Structure of mitochondria, sequence of electron carriers, sites of ATP production, inhibitors of electron transport chain. Hypothesis of mitochondrial oxidative phosphorylation (basic concepts). Inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potentials into mitochondria.

UNIT-III 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-IV AMINO ACID METABOLISM


UNIT-V 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.

PORPHYRIN METABOLISM

Biosynthesis and degradation of porphyrins. Production of bile pigments.

PRACTICAL

1. Separation of Blood Plasma and Serum
   a. Estimation of proteins from serum by biuret and lowry methods.
   b. Determination of albumin and A/G ratio in serum.

2. Estimation of bilirubin (conjugated and unconjugated) in serum.

3. i Estimation of total lipids in serum by vanillin method.
i. Estimation of cholesterol in serum.
5. Estimation of lactic acid in blood before and after exercise.
7. Separation and identification of amino acids by (a) paper chromatography and (b) thin-layer chromatography.
8. Separation of polar and non-polar lipids by thin-layer chromatography.
    b. Inhibition of alkaline phosphatase activity by EDTA.
    c. Effect of substrate concentration on alkaline phosphatase activity and determination of its $K_m$ value.
11. a. Effect of temperature on enzyme activity and determination of activation energy.
    b. Effect of pH on enzyme activity and determination of optimum pH.
    c. Effect of enzyme concentration on enzyme activity.
12. a. Preparation of starch from potato and its hydrolysis by salivary amylase.
    b. Determination of achromatic point in salivary amylase.
    c. Effect of sodium chloride on amylases.
BIOTECHNOLOGY
PAPER - I

MOLECULAR BIOLOGY & BIOPHYSICS

UNIT-I
1. DNA : Structure, types and replication
2. RNA : Structure, and type and Function

UNIT-II
1. Genetic code : Properties, codon assignment, Secondary genetic code,
2. Protein synthesis.
3. Mitochondrial genome.
4. Chloroplast genome

UNIT-III
1. Gene Therapy
2. Transposable elements.
3. DNA damage and repair
4. Tissue engineering : General Concept

UNIT-IV
1. Law of Thermodynamics.
2. Beer lambert's law
3. Radioisotopes techniques.
4. Autoradiography

UNIT-V
1. Biophysics Introduction, scope and application
2. Principle, structure, functions of the following
   a. Spectroscopy
   b. Electrophoresis
   c. Centrifugation
   d. Colorimeter
   e. Chromatography
   f. ELISA

List of Books :
8. Upadhya and Upadhya : Biophysical Chemistry.
### UNIT-I
1. Scope and aim of Biotechnology.
3. Restriction Enzymes: End O nuclease (type, Nomenclature, Restriction, Sequence, and Cleavage Pattern).
   a. Modification of cut ends.
   b. Steps in gene cloning
   c. Isolation of the desired gene.
4. cDNA Library, Genomic Library.

### UNIT-II
1. Vectors (Animal and Plant vectors)
2. Bacteriophage Vectors
3. Introduction of vectors into appropriate host.

### UNIT-III
1. PCR: Procedure (denaturation, Annealing, extension)
2. Types of PCR
3. Applications Advantages and Limitation of PCR.

### UNIT-IV
2. In vitro fertilization and embryo transfer.
3. Genome map and Genome Project.
4. Apoptosis.

### UNIT-V
1. Stem cell technology
2. Targeted Gene Transfer
3. DNA fingerprinting
4. Transgenic animals and Plants.

**List of Books:**
PRACTICAL LIST:
1. Isolation of DNA.
2. Isolation RNA.
3. Estimation of DNA from Plant Cells.
4. Laminar Flow, Autoclave, Oven Incubator water bath Quebec colony counter, Centrifuge, Spectrophotodmeter, Electrophoresis, Camera Lucida.
5. Experiments (at least - two) on the basis of electrophoresis.

SCHEME FOR PRACTICAL EXAMINATION

Time: 4 hrs. M.M.: 50

1. DNA Isolation 10 marks
2. RNA Isolation 10 marks
3. Practical based on Biophysics 10 marks
4. Spotting based on paper I and II 10 marks
   (5 spots) at least two from each paper
5. Viva - Voce 05 marks
6. Record / Sessional 05 marks

---