//SA VIDYA YA VIMUKTAYE//

SAHAKAR MAHARSHI SHANKARRAO MOHITE-PATIL PRATISTHAN, SHANKAR NAGAR, AKLUJ SANCHALIT

# PRATAPSINH MOHITE PATIL MAHAVIDYALAYA,KARMALA

## F.Y.B.Sc TIME TABLE 2021-22(Online Mode)

w.e.f 20.09.2021

| Sr.No | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| | Practical Demonstration | | | | | |
| 8.30-9.30 | Chem | Phy/Micro | Bot/Comp | Math/Zoo | | |
| | Theory Lectures | | | | | |
| 10:00-10:48 | English | English | English | English | Chemistry | Chemistry |
| 11:10-11:58 | Phy/Micro | Bot/Comp.Sci | Phy/Micro | Phy/Micro | Phy/Micro | Phy/Micro |
| 1.00-1.48 | Math/Zoo | Math/Zoo | Bot/Comp.Sci | Math/Zoo | Math/Zoo | Bot/Comp.Sci |
| 2.00-2.48 | Chemistry | Chemistry | Chemistry | Bot/Comp.Sci | Bot/Comp.Sci | Math/Zoo |

**Time table I/C**

I/C PRINCIPAL
PRATAPSINHA MOHITE-PATIL MAHAVIDYALAYA
KARMALA

**I/C Principal**

***Note: This time table is for online mode***

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SAHAKAR MAHARSHI SHANKARRAO MOHITE-PATIL PRATISTHAN, SHANKAR NAGAR, AKLUJ SANCHALIT

# PRATAPSINH MOHITE PATIL MAHAVIDYALAYA,KARMALA

## S.Y.B.Sc TIME TABLE 2021-22(Online Mode)

w.e.f 01.08.2021

| Sr.No | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 11:12-12:00 | Chemistry | Chemistry | Chemistry | Chemistry | Chemistry | Chemistry |
| 12:10-12:58 | Phy/Micro | Phy/Micro | Phy/Micro | Bot/Comp.Sci | Bot/Comp.Sci | Bot/Comp.Sci |
| 12:48-1:00 | Interval | | | | | |
| 1:10-1:58 | Bot/Comp.Sci | Bot/Comp.Sci | Math/Zoo | Phy/Micro | Phy/Micro | Math/Zoo |
| 2.10-2:58 | Math/Zoo | Math/Zoo | Bot/Comp.Sci | Math/Zoo | Math/Zoo | Phy/Micro |
| Practical Demonstration | | | | | | |
| 3:00-4:00 | Math/Zoo | Math/Zoo | | | | |
| 4:00-5:00 | Bot/Comp. | Bot/Comp. | Phy/Micro | Phy/Micro | Chemistry | Chemistry |

**Time table I/C**

**I/C Principal**

I/C PRINCIPAL
PRATAPSINHA MOHITE-PATIL MAHAVIDYALAYA
KARMALA

**Note: This time table is for online mode**

//SA VIDYA YA VIMUKTAYE//

SAHAKAR MAHARSHI SHANKARRAO MOHITE-PATIL PRATISTHAN, SHANKAR NAGAR, AKLUJ SANCHALIT

# PRATAPSINH MOHITE PATIL MAHAVIDYALAYA,KARMALA

## T.Y.B.Sc TIME TABLE 2021-22(Online Mode)

w.e.f 01.08.2021

| Sr.No | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 8:00-8:48 | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci |
| 9:00-9:48 | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci |
| 11:00-11:48 | English | English | English | English | - | - |
| | Practical Demonstration | | | | | |
| 01:00- Onwards | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | Chemistry/ Micro/ Comp.Sci | | |

**Time table I/C**

**I/C Principal**

I/C PRINCIPAL
PRATAPSINHA MOHITE-PATIL MAHAVIDYALAYA
KARMALA

**Note: This time table is for online mode**

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: PHYSICS

## Name of the Course: B.Sc. I (Semester –I and II)

**(Syllabus to be implemented from w.e.f. June 2019)**

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Choice Based Credit System (CBCS) Pattern Syllabus

B.Sc. Part I Physics (w. e. f. June 2019)

i) There will be two theory papers of 50 (80 % UA & 20 % CA) marks for each semester. Practical examination at the end of second semester will be of 100 (80 % UA & 20 % CA)marks. Total marks for physics subject will be 300 (80 % UA & 20 % CA) and 5 + 5 + 4 = 14 Credits.

ii) There shall be 2.5 periods (2.5 Credits) per paper i.e. 5 periods per week for theory and 4 periods (4 Credits) per week for each batch of 20 students for practical.

iii) The duration of theory examination for each paper will be 2 hours each and that for practical will be 6 Hours. There will be two sessions for annual practical examination morning and evening each of 3 hours.

iv)Examination of Physics theory Paper-I & II will be held at the end of first Semester.

v) Examination of Physics theory Paper-III & IV will be held at the end of second Semester.

vi) Practical examination of both semesters will be held at the end of semester II. Every student will have to perform two experiments (one experiment from each Group).

# Semester – I

# (Theory Course: DSC 1A)

## Titles of theory papers

### Core Subject DSC 1A: Physics Paper I – Mechanics and properties of matter.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

### Core Subject DSC 1A: Physics Paper II – Optics and Laser.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

# Semester – II
# (Theory Course: DSC 1B)

## Titles of theory papers

Core Subject DSC 1B: Physics Paper III – Heat and Thermodynamics.
50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

Core Subject DSC 1B Physics Paper IV –
Electricity, Magnetism and Basic Electronics.
50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

# Practical Course of Semester – I & II
# (Practical Course examination of Core DSC 1A & 1B at the end of second semester)

## Titles of Practical Groups

Core Subject Practical (DSC 1A): Group I – General Physics and Heat

50 (40 UA and 10 CA) Marks and (2 Credits)

Core Subject Practical (DSC 1B) Group II – Electricity, electronics, and optics
50 (40 UA and 11 CA) Marks and (2 Credits)

ANNUAL PRACTICAL EXAMINATION AT THE END OF 2nd SEMESTER
OF 100 Marks (UA – 80 Marks + CA – 20 Marks)

Group (I & II) experiments UA (35 * 2) + CA (10 * 2) = 70 + 20 = 90 Marks

Scale down of 35 Marks for UA per Group: As per given in the practical slips. 10 marks for certified Journal.

Scale down of 20 Marks for CA: - Internal examination of (35*2 =70 Marks reduced to 20 marks)

10 Marks for certified journal should not be given in case of loss certificate. Student may appear practical examination for 35+35=70 marks with prior permission of his/her Principal. External Examiner will allow him/her only after submission of permission letter of his/her Head of Physics Department / Principal.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

**Nature of Question Paper for choice based credit system (CBCS) Semester Pattern**
**• Faculty of Science •**
**(w. e. f. June 2019)**

**Time: - 2 hrs.** **Total Marks-40**

**Instructions:**

1. All questions are compulsory.
2. Draw **neat diagrams** and give **equations** wherever necessary.
3. Figures to the **right** indicate **full marks**.
4. Use of logarithmic table and calculator is allowed.

**Q. No.1) Multiple choice questions** (08)

1) ----------
a) b) c) d)
2)
3)
4)
5)
6)
7)
8)

**Q.No.2) Answer any four of the following** (08)

i)
ii)
iii)
iv)
v)
vi)

**Q.No.3 A) Write notes on any one of the following** (03)

i)
ii)

**B) Solve / short answer**

(05)

**Q. No.4) Answer any Two of the following** (08)

i)
ii)
iii)

**Q.No.5) Answer any one of the following** (08)

i)
ii)

**NB:** Minimum two numerical type sub questions must be asked in question number 1 and 2.
One each from question number 3A, and 4 must be of numerical type sub question.

# CORE PAPER (DSC 1A): PHYSICS PAPER - I

# Title: - Mechanics and Properties of Matter.

**Topic 1 – Moment of Inertia** **09**

Review of M.I., Moment of Inertia of 1) Circular disc 2) Rectangular lamina 3) Spherical Shell 4) Fly wheel.

**Topic 2 – Pendulums** **10**

Introduction, Theory of compound pendulum, Bar pendulum, Kater's Pendulum, Bassel's Theory, Bifilar pendulum (parallel suspensions of equal lengths), Torsional Pendulum.

**Topic 3 – Elasticity** **07**

Introduction, Equivalence of shear strain to compression and extension strains, Relation between elastic constants, Poisson's ratio of rubber tube (Theory and experimental method)

**Topic 4 – Surface Tension** **08**

Review of S.T., relation between excess pressure and surface tension, excess pressure inside a liquid drop and soap bubble, Jaeger's method to determine Surface Tension, Factors affecting Surface Tension, Applications of Surface Tension.

**Topic 5 – Viscosity and Fluid dynamics** **08**

Introduction, Newton's law of viscosity, streamline and turbulent flow, Critical velocity and Reynolds number, Equation of continuity, Energy possessed by liquid, Poiseuille's equation, Bernoulli's theorem and its applications to 1) Venturimeter 2) Automiser. Factors Affecting on viscosity.

**Reference books:-**


1) Properties of matter- D.S. Mathur
2) A Text book of properties of matter- N.S. Khare & S.Kumar
3) Physics Vol.I –David & Robert Resnick
4) University Physics-Mechanics of a particle- Anvar Kamal

# CORE PAPER (DSC 1A): PHYSICS PAPER - II

## Title: - Optics and Laser

**Topic 1 – Geometrical Optics and aberrations** **10**

Introduction, Fermat's principle, Deduction of laws of reflection and refraction by Fermat's principle, Chromatic and Spherical aberration, methods to minimize Chromatic and Spherical aberrations.

**Topic 2 – Optical Instruments** **08**

Introduction, Types of eye-pieces, Gauss eye piece, Ramsden's eye-piece, Huygen's eye-piece, Construction, working and Application of Spectrometer and Optical bench.

**Topic 3 – Interference** **08**

Introduction, Interference in parallel faced thin film (Reflected light only), wedge shaped film, Newton's rings and its applications.

**Topic 4 – Diffraction** **08**

Introduction, Types of diffraction, Plane diffraction grating and its elementary theory, its application to determine wavelength, Comparison between prism and grating spectra

**Topic 5 – Laser** **08**

Introduction, Spontaneous and Stimulated emission and absorption, Einstein's Coefficients, Population inversion, Optical Pumping, Cavity resonator, He-Ne and Ruby Laser, Properties and application.

**Reference books:-**

1. Ray Optics by R K Verma.
2..Text Book of Optics ( new edition ) – Brijlal and Subramanyam
3. Optics( second edition ) – Ajay Ghatak
4. Concept of Physics – H C Verma
5. Laser and Optics – B. B. Loud
6. Optics by Mathur

# CORE PAPER (DSC 1B): PHYSICS PAPER - III

## Title: - Heat and Thermodynamics

**Topic 1 –Transport Phenomenon** **08**

Introduction, mean free path, Claussius expression for mean free path ( Collision cross section),Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure

**Topic 2 - Liquefaction of Gases** **08**

Liquefaction of gases by J-T effect, Linde's air liquefier; cooling by adiabatic demagnetization and expression for fall in temperature, experimental setup for adiabatic demagnetization of paramagnetic substances, properties of liquid helium

**Topic 3 – Thermodynamics** **10**

Laws of thermodynamics, Reversible and Irreversible processes, Isothermal and adiabatic process, Adiabatic relations, work done during isothermal and adiabatic processes, Entropy change in reversible and irreversible processes

**Topic 4 – Heat engines** **08**

Introduction:, Carnot's heat engine and its efficiency; Heat engine, Otto cycle and its efficiency Diesel cycle and its efficiency, comparison between Otto and diesel engine.

**Topic 5 –Refrigerator** **08**

General principle, Refrigeration Cycle, coefficient of performance of refrigerator, Vapor compression Refrigerator, Air conditioning (principle and applications)

**Reference books:-**

1. Treatise on heat – Saha & Shrivastav
2. Kinetic theory of gases – V.N. Kelkar
3. Heat and Thermodynamics – Brijlal & Subrahmanyam

# CORE PAPER(DSC 1B): PHYSICS PAPER – IV

**Title: - Electricity, Magnetism and Basic Electronics**

**Topic 1 – Varying Current:** **08**

Introduction, Growth and decay of current in L-R circuit, Charging and discharging of capacitor through resistor and inductor separately. Time constant of the LR and CR circuits.

**Topic 2 – A.C. Circuits:** **08**

Complex number, J-Operator and its applications to AC circuits, Reactance, Susceptance, Impedance, Admittance and power factor, L-C-R circuit, series and parallel resonance circuits, sharpness of resonance and quality factor, AC bridge (Owen's bridge).

**Topic 3 – Magnetostatics and Ballistic Galvanometer:** **08**

Introduction:, Biot and Savart's law & its application to determine magnetic induction at a point on the axis of current carrying coil of single turn and Solenoid.

**Ballistic Galvanometer** : Construction theory and working of Ballistic Galvanometer, Damping in the B G, Constants of B G.

**Topic 4 – Electronic circuit components and Devices:** **09**

Classification of electronic circuit components as passive and active (Resistor, Capacitor, Inductor, Transformer, Switches, Relays, Diodes, Transistor, FET, SCR, UJT and IC) with their symbol and specification. Bridge rectifier with Pie-Filter, Clippers, Clampers, Zener diode and its application as a voltage regulator.

**Topic 5 – Bi-Junction Transistor (BJT):** **09**

Construction and working of transistor, input-output and transfer characteristics of CE & CB mode, Relation between $\alpha$ and $\beta$. Transistor as amplifier (CE mode)

**Reference books:-**

1) Principles of electronics –V.K. Mehta
2) Electronics principles- Malvino
3) Basic electronics & linear circuits- Bhargav, Kulshrstha &Gupta
4) Electricity and Magnetism – Khare & Shrivastav
5) Foundations of electromagnetic theory- Reitz & Milford
6) Electronic devices & circuits-Allen Mottershed

# PHYSICS PRACTICAL OF CORE DSC 1A & DSC 1B: OF 04 CREDITS

**Group I – General Physics and Heat (DSC 1A)**

1. Bar pendulum
2. Bifiler's pendulum
3. Tortional pendulum
4. Moment of Inertia of disc by annular ring
5. Poisson's ratio
6. Surface Tension by liquid drop method
7. Thermal conductivity of insulator by Lee's method
8. Viscosity of water by Poiseullie's method
9. Viscosity by Stoke's method
10. Frequency of AC mains by magnetic and nonmagnetic wire
11. Temperature coefficient of resistance of Copper wire
12. L C of various measuring instruments (V C, M S G, Spherometer, Travelling Microscope, Galvanometer, Voltmeter, Ammeter, Spectrometer, Monometer, Optical Bench); Instrumental zero errors of each instrument and its correction for more accuracy in the measurements. .

**Group II – Electricity, electronics, and optics (DSC 1B)**

1. Use of Spectrometer to determine Angle of prism
2. Dispersive power of prism
3. Diffraction grating to determine its grating element
4. LASER (to determine its wavelength of LASER beam by using diffraction grating)
5. Newton's ring (to determine Wavelength and Radius of curvature of Plano-convex lens)
6. Photo cell (verification of inverse square law)
7. Bridge rectifier and $\pi$ filter - $\beta$ & $\gamma$
8. Out Put Characteristics Transistor amplifier in CE mode: determination of $\beta$)
9. Zener diode as a voltage regulator (Plot voltage resistance graph as well as Knee Characteristic curve I – V and comments)
10. Liquid lens to determine the refractive index of any liquid
11. Impedance of LCR seris circuit.
12. Classification of electronic circuit components: (resisters, capacitors, inductors, Diodes, transistors, field effect transistors, silicon controlled rectifiers, potentiometers, rheostats, thermistors, thermocouples, Integrated Circuits, Relays); Colour code of resistors and capacitors; identification of their values.

**NB: Ten experiments from each group must be completed to certify the Journal.**

**Reference Books:-**

1) Advanced Practical physics –Nelkon
2) Practical physics - Rajopadhye and Purohit
3) Practical Physics – P R Sasi Kumar

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: CHEMISTRY

## Name of the Course: B.Sc. I ( Sem–I & II )

**(Syllabus to be implemented from w.e.f. June 2019)**

## Punyashlok Ahilyadevi Holkar Solapur University, Solapur

# SYLLABUS FOR B. Sc – I (CHEMISTRY)

CHOICE BASED CREDIT SYSTEM (CBCS) SYLLABUS

**Structure of the Course:**

- Structure of B.Sc. course in faculty of science has total of 06 semesters for 3 years.
- B.Sc.-I comprises of total two semesters. Each semester will have **two** theory papers of 80 marks for university external examination and 20 marks for internal examination for each paper.
- At the end of academic year i.e. semester II the practical examination will be conducted. The Weightage of practical is of 80 marks for university external practical examination and 20 marks for internal practical examination.
- The titles and marks distribution for each paper are as under.

| Semester | Paper No. | Title of Paper | Total Lectures | Examination | | | Total Credit |
|---|---|---|---|---|---|---|---|
| | | | | Univ. Exam | Internal Exam | Total Marks | |
| Semester I | I | Physical Chemistry | 30 | 40 | 10 | 50 | 02 |
| | II | Inorganic Chemistry | 30 | 40 | 10 | 50 | 02 |
| Semester II | III | Organic Chemistry | 30 | 40 | 10 | 50 | 02 |
| | IV | Analytical Chemistry | 30 | 40 | 10 | 50 | 02 |
| Practical | I | Chemistry | | 80 | 20 | 100 | 04 |

- **University Examination**
  1. Theory Paper I : 40 Marks
  2. Theory Paper II : 40 Marks
  3. Theory Paper III : 40 Marks
  4. Theory Paper IV : 40 Marks
  5. Practical :80 Marks

  Practical paper has 80 marks for external university practical examination. Duration of practical examination is **one day**. There will be three practicals, one from each sections physical, inorganic and organic chemistry. Out of 80 marks for external university practical examination, the mark distribution is as follows.

  Q. 1 Physical Chemistry experiment : 23 marks
  Q. 2 Inorganic Chemistry experiment : 24 marks
  Q. 3 Organic Chemistry experiment : 23 marks
  Q. 4 Oral : 05 marks
  Q. 5 Journal : 05 marks

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  Total marks : 80 marks

- **Continuous Internal Assessment for chemistry:**
  1) Each theory paper has 10 marks for internal examination. There will be 05 marks for unit test and 05 marks for home assignment.
  2) Practical paper has 20 marks for internal examination.

**Total Credits: 4**
**Marks: 100 (70+30)**

## SEMESTER-I

**PAPER –I (Physical Chemistry) (Total Credits: 2; Contact hrs: 30)**

### 1. Chemical Kinetics (Contact hrs: 12)

1.1 Chemical Kinetics and it's scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction. Concentration, pressure, temperature and catalyst.

1.2 Order and Molecularity of reaction.

1.3 First order reaction: Derivation of Rate constant. Characteristics of first order reaction. Examples: Decomposition of $N_2O_5$

1.4 Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction.
Examples : i) Reaction between $K_2S_2O_8$ and KI .

1.5 Pseudo-unimolecular reactions such as Hydrolysis of methyl acetate in presence of Acid.
(Numerical Problems Expected)

### 2. Mathematical Concepts (Contact hrs: 04)

2.1 Graphical representation : Graph paper, co-ordinates of a point, equation of straight line and intercept, plotting of graph based on experimental data.

2.2 Derivative : Rules of differentiation (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.

2.3 Integration : Rules of Integration (without proof) pertaining to algebraic and exponential functions. Example related to chemistry.
(Numerical Problems not expected)

### 3. Thermodynamics: (Contact hrs: 04)

3.1 Spontaneous and non spontaneous processes, Second law of thermodynamics and its different statements.

3.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.
(Numerical Problems Expected)

### 4. Gaseous State: (Contact hrs: 10)

4.1 a) Ideal and Non ideal gases, b) Deviation from ideal behaviour. (Only Boyle's law)
c) Causes of deviation, van der Waal's equation, explanation of real gas behavior by van der Waal's equation.

4.2 Critical Phenomena : PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.

4.3 Liquification of gases, Joule-Thomson effect.
(Numerical Problems expected)

**Reference Books:**


1) Mathematical preparation of Physical Chemistry : F. Daniel Mc-Graw Hill Book Com.
2) Elements of Physical Chemistry : S. Glasstone and D. Lewis (D. Van Nostrand Co. Inc)
3) Physical Chemistry : W. J. Moore (Orient Longman)
4) Principles of Physical Chemistry : Maron Prutton
5) University Chemistry : B. H. Mahan (Addision - Weseley Publ. Co.)
6) Chemistry Principle & Applications : P.W. Atkins, M. J. Clugsto, M.J. Fiazer, R. A. Y. Jone (Longman)
7) Physical Chemistry : G. M. Barrow (Tata Mc-Graw Hill)
8) Essentials of Physical Chemistry : B. S. Bahl & G.D. Tuli (S. Chand)
9) Physical Chemistry : A. J. Mee.
10) Physical Chemistry : Daniels - Alberty.
11) Principles of Physical Chemistry : Puri - Sharma (S. Nagin)
12) Text Book of Physical Chemistry : Soni Dharmarha
13) University General Chemistry : CNR. Rao (McMillan)
14) Chemistry : Sienko - Plane ( Recent Edn,.)
15) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)
16) Physical Chemistry : S. Glasstone.
17) Basic Chemical Thermodynamics : V. V. Rao.

# SEMESTER-I

**PAPER –II (Inorganic Chemistry)**

**(Total Credits: 2; Contact hrs: 30)**

## 1. Atomic Structure and periodic properties (Contact hrs: 06)

1.1 Atomic Structure

a) Shapes of s, p, d orbitals.

b) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity

c) General electronic configuration of s and p block elements.

1.2 General Characteristics of s and p block elements w.r.t. Atomic and Ionic radii, Ionization energy, Electron affinity, Electronegativity, Reactivity, Melting and Boiling point

## 2. Chemical bonding and Ionic Solids (Contact hrs: 08)

2.1 Types of chemical bonding

2.2 Ionic Bonding

a) Formation of ionic bond, Energetics of ionic bonding : Ionisation potential, Electron affinity and Lattice energy.

b) Characteristics of ionic compounds.

c) Born-Haber Cycle for Alkali metal halide (NaCl).

d) Fajan's rules.

2.3 Radius ratio and crystal structure.

a) Definition: Radius ratio (r+ / r-), Coordination number, Stoichiometry and unit cell.

b) Concept and calculation of radius ratio (r+ / r-) for ionic solid with octahedral geometry.

c) Radius ratio effect on geometry.

d) Crystal structure of NaCl and CsCl w.r.t. unit cell, radius ratio, coordination number and stoichiometry.

## 3. Covalent bonding: Valence Bond Theory (VBT) Approach (Contact hrs: 08)

3.1 Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory

3.2 Limitations of VBT

3.3 Need of Hybridization

3.4 Types of hybridization and shapes of simple inorganic molecules: $BeCl_2$, $BF_3$, $SiCl_4$, $PCl_5$, $SF_6$, $IF_7$.

3.5 Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. $NH_3$, $H_2O$, $ClF_3$

## 4. Covalent bonding: Molecular Orbital Theory (MOT) Approach (Contact hrs: 08)

4.1 Atomic and Molecular orbitals.

4.2 L.C.A.O. Principle

4.3 Bonding, Antibonding and Nonbonding Molecular orbitals.

4.4 Conditions for successful overlap

4.5 Different types of overlap (s-s, s-px, px - px and py- py or pz- pz)

4.6 Energy level sequence of molecular orbitals for n = 1 and n = 2

4.7 M. O. Diagrams for: a) Homonuclear diatomic molecule. $H_2$, $Li_2$, $Be_2$, $C_2$, $N_2$ and $O_2$

b) Heteronuclear diatomic molecules CO and NO w.r.t. bond order stability and magnetic properties.

**Reference Books:**

1) Advanced Inorganic Chemistry - Cotton and Wilkinson
2) Inorganic Chemistry - J. E. Huheey
3) Concepts and models of Inorganic Chemistry - Douglas & Mc-Daniel
4) Principles of Inorganic Chemistry - Puri, Sharma
5) New Concise Inorganic Chemistry - (ELBS) - J. D. Lee
6) Text book of Inorganic Chemistry - P. L. Soni
7) Advanced Inorganic Chemistry - Satyaprakash, Tuli, Basu
8) Theoretical Principles of Inorganic Chemistry - G. S. Manku
9) Principles of Inorganic Chemistry - Puri, Sharma & Kalia
10) Inorganic chemistry: Principles of structure and reactivity – J. E. Huheey
11) Advanced Inorganic Chemistry, Vol. I – Gurudeep Raj
12) A New Guide to Modern Valency Theory- G. J. Brown

**SEMESTER-II**
**PAPER III: (Organic Chemistry)**
**(Total Credits: 2; Contact hrs: 30)**

## 1. Fundamentals of organic reaction mechanism (Contact hrs: 05)

1.1 Meaning of reaction mechanism.
1.2 Curved arrow notation, Half headed and double headed arrows.
1.3 Types of bond breaking : Homolytic and Heterolytic.
1.4 Types of reagents : Electrophilic and Nucleophilic.
1.5 Types and sub-types of following organic reactions with definition and at least one example of each. a) Substitution b) Addition c) Elimination d) Rearrangement. (Mechanism is not expected)
1.6 Reactive Intermediates with examples carbocations, carbanions (formation, structure, stability and reactions are expected). Carbon free radicals, carbenes, arenes, nitrenes (Definition with example only)

## 2. Structure and Bonding (Contact hrs: 05)

2.1 Hybridization: $sp^3$, $sp^2$ and sp w.r.t. methane, ethylene and acetylene respectively.
2.2 Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. : $sp^3$, $sp^2$ and sp hybridization
2.3 Resonance effect with respect to phenol, and nitrobenzene.
2.4 Hyperconjugation w.r.t. toluene.
2.5 Inductive effect, + I and - I .
2.6 Steric effect w.r.t. mesitoic acid.

## 3. Cycloalkanes (Contact hrs: 03)

3.1 Cycloalkanes - Nomenclature methods of formation
(a) Internal Wurtz reaction
(b) Distillation of calcium or barium salt of dicarboxylic acid.
3.2 Chemical properties of cyclopropane
(i) Free radical substitution of chlorine in presence of light.
(ii) Action of HBr and conc. $H_2SO_4$ iii) Catalytic reduction by $H_2$/Ni

## 4. Alkenes, Dienes and Alkynes (Contact hrs: 06)

4.1 Nomenclature of alkenes.
4.2 Methods of formation of alkenes with mechanism
i) By dehydration of lower alcohols.
ii) By dehydrohalogenation of lower alkyl halides.
4.3 Chemical reactions of alkenes - Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with $KMnO_4$, Polymerisation of alkenes - ethylene and propylene
4.4 Nomenclature and classification of dienes.
4.5 Isolated, Conjugated and cumulated dienes.
4.6 Butadiene-Methods of formation,polymerisation,1:2 and 1:4additions and Diels-Alder reaction.
4.7 Alkynes - Nomenclature, Acidity of alkynes.
4.8 Electrophilic and Nucleophilic addition reactions, Hydroboration, oxidation.

## 5. Stereochemistry of organic compounds (Contact hrs: 05)

5.1 Types of stereo-isomerism - Optical isomerism, Geometrical isomerism and Conformational isomerism.
5.2 Chiral center [Explanation with lactic acid]
5.3 Elements of symmetry
5.4 Optical isomerism in lactic acid, tartaric acid and 2,3 - dihydroxy butanic acid
5.5 Enantiomers and diastereoisomers.
5.6 Racemic modification.
5.7 Geometrical isomerism-cause of geometrical isomerism.
5.8 Geometrical isomerism w.r.t. C = C
Geometrical isomerism in maleic acid and fumaric acid.

## 6. Aromaticity and Benzene (Contact hrs: 06)

6.1 Meaning of the terms - Aromatic, non-aromatic, antiaromatic and psuedoaromatic compounds.
6.2 a) Kekule structure of benzene
b) Resonance structures of benzene.
c) Molecular orbital picture of benzene.
d) Representation of benzene ring.
6.3 Modern theory of aromaticity. Fundamental Concepts - delocalisation of electrons, coplanarity and Huckel's $(4n + 2)\ \pi$ rule. Applications of Huckel's rule to napthalene, pyrrole and pyridine.
6.4 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenation and Friedel - Craft's reaction- alkylation and acylation.

**Reference Books**

1) Organic Chemistry : Hendrickson, Cram, Hammond.
2) Organic Chemistry : Morrison and Boyd
3) Organic Chemistry : Volume I and II I.L. Finar
4) Organic Chemistry : Pine
5) Advanced Organic Chemistry : Sachinkumar Ghosh
6) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl
7) A Guide book to Mechanism in organic Chemistry : Peter Sykes
8) Stereochemistry of Organic Chemistry : Kalsi,
9) Stereochemistry of Carbon Compounds : Eliel
10) Text book of Organic Chemistry : P. L. Sony
11) Practical Organic Chemistry : By A. I. Vogel
12) Advanced Organic Chemistry - Reactions, Mechanism and Structure : Jerry March
13) Organic Chemistry : M.R. Jain
14) Organic Chemistry : J. M. Shaigel

**SEMESTER-II**
**PAPER IV: (Analytical Chemistry)**
**(Total Credits: 2; Contact hrs: 30)**

## 1. Physical properties of liquids (Contact hrs: 10)

1.1 Introduction, additive and constitutive properties
1.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer
1.3 Surface tension:- Determination of surface tension by Drop –Weight method
1.4 Parachor:-Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and $NO_2$ group
1.5 Dipole moment, electrical polarization of molecules
1.6 Use of dipole moment in the study of molecular structure
1.7 Refractive index, Snell's law
1.8 Specific and molecular refractivity, Abbe's refractometer: Principle-critical angle phenomenon-construction, working and advantages
1.9 Molecular refractivity and chemical constitution.

## 2. Environmental Chemistry: Air pollution (Contact hrs: 04)

2.1 Introduction: Meaning of terms: Environment, Pollution, Pollutant, Threshold Limit Value (TLV), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD)
2.2 Types of Pollution (Only Introduction): Air pollution, Water pollution, Sound pollution, Soil pollution, Automobile pollution and nuclear pollution.
2.3 Air Pollution: Classification of Air pollutants, Oxides of carbon, Sulphur and Nitrogen as air pollutants with respect to source and health hazards.

## 3. Environmental Chemistry: Water pollution (Contact hrs: 06)

3.1 Introduction: Resources of water, Types of water Pollutants, water Pollution and its sources (Brief Account)
3.2 Treatment of water:
A) Potable Water: Parameters of potability of water
Step I: Removal of suspended matter :
a) Prolonged storage b) Screening
c) Sedimentation d) Coagulation
e) Filtration
Step II: Removal of germs and bacteria- Physical and Chemical method.
Physical Methods : a) Boiling b) Exposure to UV or Sunlight
c) Distillation.
Chemical Method : a) Chlorination b) Fluorination
c) Ozonisation d) Aeration
e) Use of $KMnO_4$
B) Industrial Water: Mention names of the methods only, Ion exchange method in detail.
C) Municipal Sewage: Meaning of Sewage; mention the names of methods; activated sludge process in detail.

**4. Qualitative and Quantitative elemental analysis** **(Contact hrs: 06)**

4.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur

4.2 Quantitative analysis of -

i) Carbon and hydrogen by Combustion method

ii) Nitrogen by Kjeldahl's method

iii) Halogen and Sulphur by Carius method.

4.3 Determination of molecular weight of an acid by titration method.

4.4 Empirical formula and molecular formula determination. (Numerical Problems Expected)

**5. Petroleum and petrochemicals** **(Contact hrs: 04)**

5.1 Constituents and refining of petroleum, cracking, knocking, octane, hydro-forming

5.2 Synthesis and Industrial applications of following petrochemicals:

a) Ethylene oxide

b) Adipic acid

c) Styrene

d) 2-Phenyl ethanol

e) Paracetamol

## Reference Books


1) Chemistry - Central Science, Brown, Lemay, Bursten 8th Edition.

2) Principles of Physical Chemistry - S.H.Maron / C.F.Prutton

3) Elements of Physical Chemistry - P.Atkins / J.Paula

4) Essentials of Physical Chemistry - A.Bahl / B.Bahl / G.Tuli

5) Textbook of Physical Chemistry - S.Glasstone

6) Principles of Physical Chemistry - B.Puri / L.Sharma / M.Pathania

7)Textbook of Physical Chemistry - P.Soni /O.Dharmarha

8) Environmental Chemistry - A.K. De

9) Environmental pollution analysis - S.M. Khopkar

10) Organic Chemistry : Hendrickson, Cram, Hammond.

11) Organic Chemistry : Morrison and Boyd

12) Organic Chemistry : Volume I and II I.L. Finar

13) Organic Chemistry : Pine

14) Advanced Organic Chemistry : Sachinkumar Ghosh

15) Advanced Organic Chemistry : B.S. Bahl and Arun Bahl

16) Practical Organic Chemistry : By A. I. Vogel

17) Industrial Chemistry : Rogers

18) Industrial Chemistry : R.K.Das

19 )Industrial Chemistry : B. K. Sharma

## B.Sc. – I (Chemistry Practical Course)

**N.B.** i) Use of Digital balance is allowed.
ii) Use S.I. Units Wherever Necessary.

### A) Physical Chemistry.

1) Determination of viscosity of given liquids A and B. (Density data of liquids, viscosity of water to be given.) [Any two liquids from, Acetone, $CCl_4$, Ethyl alcohol, Ethylene glycol and n- propyl alcohol]
2) Determination of equivalent weight of Mg by Eudiometer.
3) Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.
4) Study of specific reaction rate of hydrolysis of methyl acetate in presence of $H_2SO_4$
5) Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)
6) Determination of heat of ionization of weak acid.

**Reference Books :**

1) Practical book of Physical Chemistry : Nadkarni, Kothari & Lawande.
2) Experimental Physical Chemistry : A. Findlay.
3) Systematic Experimental Physical Chemistry : S.W. Rajbhoj, Chondhekar (Anjali Pub.)
4) Experiments in Physical Chemistry : R.C.Das and B. Behra. (Tata Mc. Graw Hill)
5) Advanced Practical Physical Chemistry : J. B. Yadav (Goel Publishing House)
6) Practical Physical Chemistry : B. D. Khosala ( R. Chand & Sons.)
7) Experiments in Chemistry : D. V. Jagirdar

## B) Inorganic Chemistry

**1) Inorganic Quantitative Analysis:** Volumetric Analysis

i) To prepare a standard solution of Oxalic acid and determine the strength of Sodium hydroxide solution in terms of normality and $Kg/dm^3$

ii) To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and $Kg/dm^3$

ii) To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and $Kg/dm^3$ (Use internal indicator)

### 2) Qualitative Analysis:

1) Spot Tests: Detection of following cations using spot tests : $Cu^{2+}$, $Co^{2+}$, $Ni^{2+}$, $Fe^{3+}$, $Zn^{2+}$, $Mg^{2+}$, $Al^{3+}$, $Pb^{2+}$.
2) Chromatography: Separation and identification of cations by Paper Chromatographic technique from the following mixtures :
   a) $Ni^{2+}$ + $Cu^{2+}$
   b) $Ni^{2+}$ +$Co^{2+}$
   c) $Cu^{2+}$ + $Co^{2+}$

**Reference Books :**

1) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
2) Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
3) Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar.

## C) Organic Chemistry

### 1) Estimations : (any two)

i) Estimation of aniline, ii) Estimation of acetamide and iii) Estimation of Aspirin

### 2) Organic Qualitative Analysis.

Identification of at least five organic compounds with reactions including one from acids, one form phenols, one from bases and two from neutrals from the list of the compounds given below-

i) Acids : Oxalic acid, Benzoic acid and Cinnamic acid
ii) Phenols : β - Naphthol, Resorcinol.
iii) Bases : Aniline, p - Toluidine.
iv) Neutrals : Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-dinitrobenzene, Thiourea.

***Note :*** A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the detection of elements and functional group.

1) Preliminary tests and physical examination.
2) Determination of physical constant.
3) Detection of Elements.
4) Determination of functional group.
5) A search into the literature.
6) Special Test.
7) Summary.
8) Result.

### 3) Organic Preparation: (Any one)

i) Preparation of benzoic acid from benzamide.
ii) Preparation of dibenzal acetone from benzaldehyde and acetone.
(Wt. of crude product is expected. M.P. of the recrystallized product is not expected.)

### Reference Books:

1) Vogel's Text Book of Quantitative Chemical Analysis, (Longman) ELBS. Edition
2) Vogel's Text Book of Qualitative Chemical Analysis, (Longman) ELBS. Edition
3) Hand book of Organic Qualitative Analysis : Clarke
4) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
5) Comprehensive Practical Organic Chemistry preperation and Quantitative Analysis. : V.K. Ahluwalia, Renu Agarwal, University Press. Distributor - Orient Longman Ltd.,
6) A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni, Dastane Ramchandra and Co. Pune

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**Nature of Question Paper for choice based credit system (CBCS) Semester Pattern**
**• Faculty of Science •**
**(w. e. f. June 2019)**

**Time: - 2 hrs.** **Total Marks-40**

**Instructions:**

1. All questions are compulsory.
2. Draw **neat diagrams** and give **equations** wherever necessary.
3. Figures to the **right** indicate **full marks**.
4. Use of logarithmic table and calculator is allowed.
   (At. Wts.: H=1, C=12, O=16, N= 14, Na =23, Cl = 35.5)

**Q. No.1) Multiple choice questions** (08)

1) ----------
   a) b) c) d)
2)
3)
4)
5)
6)
7)
8)

**Q.No.2) Answer any four of the following** (08)

i)
ii)
iii)
iv)
v)
vi)

**Q.No.3 A) Write notes on any one of the following** (03)

i)
ii)

**B) Solve / short answer** (05)

**Q. No.4) Answer any Two of the following** (08)

i)
ii)
iii)

**Q.No.5) Answer any one of the following** (08)

i)
ii)

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: Microbiology

## Name of the Course: B.Sc. I ( Sem–I & II )

**(To be effective from the academic year June-2019).**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Science

### Choice Based Credit System (CBCS)
**(W.e.f. June 2019)**

- **Choice Based Credit System:** With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level.

  The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

- **Outline of Choice Based Credit System:**
  1. ***Core Course:*** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
  2. ***Elective Course:*** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

     **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.
  3. ***Ability Enhancement Courses (AEC):*** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

- **Credit:** Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits.

  Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks. It is 80+20 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

- **Conversion of marks into Grades:**

  A table for the conversion of the marks obtained by a student in each paper (out of 100) to grade and grade point is as given below:

| Sr. No. | Range of Marks | Grade | Grade Point |
|---|---|---|---|
| 1 | 80 – 100 | O | 10 |
| 2 | 70 – 79 | A+ | 9 |
| 3 | 60 – 69 | A | 8 |
| 4 | 55 – 59 | B+ | 7 |
| 5 | 50 – 54 | B | 6 |
| 6 | 45 – 49 | C+ | 5 |
| 7 | 40 – 44 | C | 4 |
| 8 | <39 | FC | 0 (Failed in Term Exam) |
| 9 | <39 | FR | 0 (Failed in Internal Assessment) |

1. **Grade Point Average at the end of the Semester (SGPA)**

$$SGPA = \frac{(G_1 \times C_1) + (G_2 + C_2) + \dots}{\sum C_i}$$

($\Sigma C_i$ = the total number of credits offered by the student during a semester)

2. **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{(G_1 \times C_1) + (G_2 + C_2) + \dots}{\sum C_i}$$

($\Sigma C_i$ = the total number of credits offered by the student upto and including the semester for which CGPA is calculated.)

3. **Final Grade Point Average (FGPA)**

It will be calculated in the similar manner for the total number of credits offered for the completion of the said course.

Where: $C_i$ = Credits allocated for the $i^{th}$ course.

$G_i$ = Grade point scored in the $i^{th}$ paper (subject)

4. **Conversion of average grade points into grades:**

| SGPA/CGPA/FGPA | Letter Grade |
|---|---|
| 9.5 – 10 | O |
| 8.5 – 9.49 | A+ |
| 7.5 – 8.49 | A |
| 6.5 – 7.49 | B+ |
| 5.5 – 6.49 | B |
| 4.5 – 5.49 | C+ |
| 4.0 – 4.49 | C |
| <3.99 | FC / F |
| | FR |

- **General guidelines for syllabus Structure:**
  - The University follows semester system.
  - An academic year shall consist of two semesters.
  - Each B.Sc. course shall consist of three years i.e. six semesters.
  - B.Sc. Part-I Microbiology shall consist of two semesters: Semester I and Semester II.

    In semester I, there will be two core papers. Each paper is having of 100 marks. Similarly in Semester II there will be two core papers. Each paper has 100 marks weightage. English will be as Ability Enhancement Course (AECC) in both Semester I and II. English paper carries 100 marks in each semester.

    The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below. For B.Sc. Part-I Microbiology semester I & II the internal assessment will be based on Internal tests, Home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as given below. Practical course examination is of 100 marks shall be conducted at the end of II semester. The practical examination of 100 marks shall also consist of 80 marks for University practical assessment and 20 marks for college internal assessment.

    For University practical examination out of two examiners, both examiner will be internal. Both examiners will be appointed by the College. The internal practical assessment shall be done as per scheme given below.
- **Scheme of Evaluation**

  As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks.

**Semester – I**

**Theory: (100 marks)**

University Examination (80 marks): No. of theory papers: 2

**Internal Continuous Assessment: (20 marks)**

Scheme of marking: 10 marks – Internal test
10 marks – Home assignment / tutorials / seminars / viva/

**Semester – II**

**Theory: (100 marks)**

University Examination (80 marks): No. of theory papers: 2

**Internal Continuous Assessment: (20 marks)**

Scheme of marking: 10 marks – Internal test
10 marks – Home assignment / tutorials / seminars / viva/

P**ractical Examination: (100 marks)**

College Internal Examination (100 marks): No. of practical course: 1

**Internal Continuous Assessment: (20 marks)**

Scheme of marking: 10 marks – Internal test on any two practicals
10 marks – Lab Journal / Viva/attendance, / attitude/sincerity/ field Visits etc.

- **Passing Standard**

  The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same 70 marks of external examination and his performance shall be scaled to 100 marks.

- **ATKT**

  Candidate passed in all papers, except 5 (five) papers combined together of semester I and II of B.Sc. Part-I Microbiology examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Microbiology .

**Solapur University, Solapur: Faculty of Science**
**Choice Based Credit System (CBCS), (w.e.f.2019-20)**
**Structure for B. Sc-I: Microbiology**

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- I Semester – I** | | | | | | | | | |
| | English | Paper- I | | 4.0 | | | 100 | 80 | 20 | 4.0 |
| | DSC 1A | Paper-I | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-II | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 2A | Paper-I | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-II | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 3A | Paper-I | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-II | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 4 A | Paper-I: Fundamentals of Microbiology | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-II: Basic Techniques in Microbiology s | | 2.5 | -- | -- | 50 | 40 | 10 | |
| **Total** | | | | **24** | -- | -- | **500** | **400** | **100** | **20** |
| **Class :** | **B.Sc.- I Semester II** | | | | | | | | | |
| | English | Paper- II | | 4.0 | | | 100 | 80 | 20 | 4.0 |
| | DSC 1B | Paper-III | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-IV | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 2B | Paper-III | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-IV | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 3B | Paper-III | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-IV | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | DSC 4B | Paper-III: Microbial Physiology | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Paper-IV: Applied Microbiology | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | Democracy, Elections and Good Governance | | | 3.0 | | | 50 | 40 | 10 | NC |
| **Total (Theory)** | | | | **27** | -- | -- | **550** | **440** | **110** | **20** |
| | DSC 1 A & 1B | Practical I and II | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 2 A & 2B | Practical I and II | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 3 A & 3B | Practical I and II | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 4 A & 4B | Practical I and II | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| **Total (Practical)** | | | | | | **16** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | | **51** | | **16** | **1450** | **1160** | **290** | **56** |

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## SYLLABUS FOR B.Sc – I (MICROBIOLOGY) (C.B.C.S)
## THEORY SEMESTER I

## DSC 4 A: PAPER –I (Fundamentals of Microbiology)

**Total Contact hrs: 45**
**Total credits 2.5**

**UNIT–I: History and Scope of Microbiology (10)**

**A) History**

1. Development of microbiology as a discipline, Spontaneous generation *vs*. biogenesis.
2. Contributions of Antony von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming ,John Tyndall
3. Role of microorganisms in fermentation, Germ theory of disease,
4. Contributions of Martinus W. Beijerinck and Sergei N. Winogradsky in soil microbiology.

**B) Scope:**

1. Introduction to types of microorganisms – Bacteria, viruses, algae, protozoa, fungi
2. Various branches of Microbiology.
3. Beneficial and harmful activities of microorganisms.

**UNIT –II: Diversity of microbial world (08)**

**A) Taxonomy, Morphology & Cytology of Bacteria**

**I) Bacterial Taxonomy**:-

1. General principles of Bacterial nomenclature
2. Criteria for bacterial classification – Morphological, Cultural and Biochemical Characters

**II)** Difference between Prokaryotic & Eukaryotic cell.

**UNIT III: General characters of different groups of microorganisms – Cellular and acellular. (20)**

1. Size, Shape, arrangement of bacteria
2. Structure of typical Bacterial cell
3. Structure and function of Cell Wall, Cell Membrane, Capsule & Slime layer, and Flagella.

**UNIT – IV: General characteristics of various microorganisms. (07)**

1. General characters, structure and economic importance of – Fungi and protozoa.
2. Archaebacteria, Rickettsia and Actinomycetes,
3. Acellular- Definition, General properties of Viruses. viroids and prions.

## DSC 4 A: PAPER-II: Basic Techniques in Microbiology

**Total Contact hrs: 45**
**Total credits 2.5**

**Unit I Microscopy (08)**

1. Basic concepts in Microscopy - magnification, Numerical aperture, resolving power and working distance.
2. Principle, working and ray diagram of compound microscope,
3. Introduction to electron microscope.
4. Comparative study of compound and electron microscope.

**Unit II - Staining Techniques (10)**

1. Definition of Stains and dyes.
2. Classification of stains – Acidic, Basic & Neutral with examples
3. Principle, procedure, mechanism and applications of following staining procedures – Simple, Negative, Differential: - Gram Staining, Acid fast staining.
4. Special staining methods-
   a) Cell wall: - Chance's Method
   b) Capsule: - Maneval's method.
   c) Volutine granules – Albert's method
   d) Lipid granule staining – Burdon's method

**Unit III : Sterilization Techniques (12)**

1. Definitions:-Sterilization, Disinfection, Antiseptic, Germicide, Microbiostasis, Sanitization
   a) Sterilization by Physical agents –Temperature – Dry heat, moist heat, Desiccation
   b) Osmotic Pressure
   c) Radiation – U. V.rays and –γ rays
   d) Filtration – Asbestos, membrane Filtration.
2. Sterilization by chemical agents –
   a) Phenol & Phenolic compounds
   b) Ethyl alcohol
   c) Halogens – Cl and Iodide.
   d) Heavy Metals - Copper & Mercury,
   e) Gaseous agents – Ethylene oxide, β-Propiolactone, Formaldehyde

**UNIT–IV: Cultivation techniques of microorganisms (15)**

**A) Culture Media: -**

1. In vivo -Living – Embryonated egg, Animal Tissue Culture
2. In vitro – Non-living media,- Natural, Synthetic, Semi synthetic, Differential, Enriched, Selective

**B) Methods of Pure culture: -**

1. Streak Plate
2. Serial dilution: - Spread Plate and Pour Plate

# SEMESTER II
# DSC4B: PAPER III
# Microbial Physiology

**Total Contact hrs: 45**
**Total credits 2.5**

**UNIT: - I Macromolecules** **(12)**

1) Structure & Functions of -

a) Carbohydrates b) Proteins c) Lipids d) DNA e) RNA

**UNIT- II- Microbial Enzymes** **(8)**

a) Definition, basic structure-apoenzyme, coenzymes, cofactors & prosthetic groups

b) Types of Enzymes – Extra & Intracellular, Constitutive & Induced Enzymes – with example.

c) Mechanism of action –active site, Lock and key hypothesis, induced fit hypothesis.

**UNIT- III -**

**Microbial Metabolism:-** **(10)**

a) Definition – Anabolism, Catabolism, Metabolism, and High energy compounds.

b) Structure & energy content of ATP

c) Catabolism of Glucose – EMP, Fate of Pyruvate, TCA Cycle

**UNIT- IV - Microbial Nutrition and Growth** **(15)**

**A) Microbial Nutrition**

a) Nutritional requirements of microorganisms

b) Common components-

Peptone, Meat extract, NaCl, Agar-agar

c) Selective and differential components

Vitamins, Sugar, Sodium taurocholate, milk, starch, Blood and Serum.

c) Common indicators & their functions:-Andrade's, Neutral Red, Bromothymol Blue, Brilliant green, Phenol red and Methylene blue.

d) Nutritional types of Microorganisms based on Carbon & Energy Source

**DSC 4B: PAPER IV**

# Applied Microbiology

**Total Contact hrs: 45**
**Total credits 2.5**

**UNIT -I- WATER MICROBIOLOGY (12)**

i) Sources of microorganisms in water

ii) Fecal pollution of water & its indicator

iii) Routine bacteriological analysis of water

Tests for coliforms – Qualitative (Presumptive, Confirmed & Completed)

Differentiation of coliforms – IMViC & Eijkman test Quantitative – MPN

iv) Municipal Water purification – Sedimentation, Filtration, Disinfection

**UNIT II- SEWAGE MICROBIOLOGY (12)**

Definition, Different types of sewage, Microbial flora, Definition of B.O.D and C.O.D, Treatment of sewage – primary, secondary and tertiary

**UNIT III - MILK MICROBIOLOGY (06)**

a) Definition and Composition of Milk

b) Sources of contamination

c) Microbiological examination of Milk: -DMC, SPC , MBRT test

d) Pasteurization –Definition and types of pasteurization, Phosphatase test.

**UNIT – IV: MEDICAL MICROBIOLOGY (15)**

**A) Definitions**:-

Infections, etiology, etiological agents, disease, pathogen, incubation period, fomite pathogenecity, virulence, morbidity rate, mortality rate, opportunistic pathogen, epidemiology, prophylaxis, carriers, host

**B) Types of diseases**:-

Epidemic, endemic, pandemic & sporadic

**C) Types of infections:-**

Primary, Secondary, acute, chronic, reinfection, cross infection, Mixed infection, congenital, local, and generalized

**D) Mode of transmission of diseases** –

1. Inoculation 2. Ingestion 3. Contact 4. Inhalation

**E) Preventive and control measures for**

1. Water and food borne diseases.

2) Air borne diseases.

3) Vector borne diseases

4) Diseases transmitted through physical contact

## Suggested reading


1. Tortora GJ, Funke BR and Case CL. (2008). Microbiology: An Introduction. 9th edition. Pearson Education
2. Madigan MT, Martinko JM, Dunlap PV and Clark DP. (2014). Brock Biology of Microorganisms.
3. Wiley JM, Sherwood LM and Woolverton CJ. (2013) Prescott's Microbiology. 9th Edition. McGraw Hill International.
4. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
5. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.
6. General Microbiology Vol I and II –Pawar and Daginawala.

## Practical Course
### B.Sc. – I Microbiology

**Marks: 100**

1. Good microbiology laboratory practices and Biosafety
2. Principle, working and applications of Common laboratory instruments
   a) Autoclave
   b) Hot Air Oven
   c) Incubator
   d) Colony Counter
   e) Seitz filter
   f) Laminar Air flow
3. Handling and Care of compound Microscope
4. Preparation of Saline and culture media
   a) Peptone Water
   b) Nutrient Broth
   c) Nutrient agar
   d) MacConkey's agar
   e) Starch Agar
   f) Milk agar,
   g) Sabouraud's agar
5. Staining Procedures
   (a) Monochrome
   (b) Negative
   (c) Gram
6. Special Staining Procedures (a)Cell Wall (Chance's Method) b) Capsule (Maneval's Method) c) Volutine granules (Albert's method d) Lipid granule staining (Burdon's method)
7. Isolation of microorganisms from natural sources- soil,Water/Sewage by four quadrant method by studying Colony Characters, Gram Staining and Motility of
   *(a) Bacillus Spp.*
   *(b) Escherichia coli*
8. Microbial examination of milk
   Standard plate count (SPC)(by spread plate)
   MBRT
9. Mounting of Fungi
   *(a) Aspergillus*
   *(b) Rhizopus*
   *(c) Penicillium*
   *(d) Mucor*
10. Study of biochemical and enzymatic activity of microorganisms by
    (a) Indole production test.
    (b) Methyl red test
    (c) Voges Proskauer's test
    (d) Citrate utilization test (Simmon's citrate)
    (e) Hydrogen sulphide production test
    (f) Glucose fermentation.
    Study of enzyme activity of microorganisms
    (g) Amylase activity
    (h) Caseinase activity

**B.Sc.Part I Microbiology**

**Practical Question Paper** **Total Marks: 100 (80+20)**

| | Marks |
|---|---|
| Q. 1. Isolation, Colony Characters, Gram Staining and Motility of *Bacillus spp / E.coli* Or Standard plate count of Milk | 25 |
| Q.2 Staining Cell wall/ Capsule/ lipid / volutine granules. | 20 |
| Q. 3 Biochemical Test/ Enzymatic activity Indol/ Methyl Red/ Voges proskauer/ Citrate Utilization/ $H_2S$/ Amylase/ Caseinase/ Glucose fermentation/MBRT | 20 |
| Q. 4 Spotting (A) Identify and give its Use (Microscope Part) (B) Identify and give Significance of Mounted Fungus (C) In which Staining Method it is used and give its significance (Stain) (D) In which Medium it is used and give its significance (Media Component) (E) In which Test it is used and give its significance (Indicator/Reagent) | 10 |
| Q. 5. Journal | 5 |

| **Internal practical examination** | **(20 marks)** |
|---|---|
| Isolation by studying colony characters/staining techniques | 10 |
| Spotting | 05 |
| Viva,Journal,Attendance | 05 |

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: ZOOLOGY

## Name of the Course: B.Sc. I ( Sem–I & II )

**(To be effective from the academic year June-2019).**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur,
## Faculty of Science
### Choice Based Credit System (CBCS)
### ( 2019 -2020 : W.e.f. June 2019)

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**Choice Based Credit System:** With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level.

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

· **Outline of Choice Based Credit System:**

1. ***Core Course:*** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. ***Elective Course:*** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

**Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. ***Ability Enhancement Courses (AEC):*** The Ability Enhancement (AE) Courses may be of two kinds: **Ability Enhancement Compulsory Courses (AECC)** and **Skill Enhancement Courses (SEC).** "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

· **Credit:** Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Science

## Choice Based Credit System (CBCS),(w.e.f.2019-20) Structure for B. Sc-I Zoology

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- I Semester – I** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English (communication skill) | Paper- I | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will be ELECTIVE Subjects.) | | DSC 1A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4A **Zoology -Animal Diversity I and II** | Paper-I **Animal Diversity I** | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II **Animal Diversity II** | 2.5 | -- | -- | 50 | 40 | 10 | |
| **Total** | | | | **24** | -- | -- | **500** | **400** | **100** | **20** |
| **Class :** | **B.Sc.- I Semester - II** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English (Communication skill) | Paper- II | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will be ELECTIVE Subjects.) | | DSC 1B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4B **Zoology-Comparative Anatomy and Developmental Biology of vertebrates** | Paper-III **Comparative Anatomy of vertebrates** | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV **Developmental Biology of vertebrates** | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | Democracy, Elections and Good Governance | | 3.0 | | | 50 | 40 | 10 | NC |
| **Total (Theory)** | | | | **27** | -- | -- | **550** | **440** | **110** | **20** |
| **Core** | | DSC 1 A & 1B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 2 A & 2B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 3A & 3B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 4A & 4B **Zoology** | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| **Total (Practical)** | | | | | | **16** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | | **51** | | **16** | **1450** | **1160** | **290** | **56** |

***Core Subjects**

**Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**Faculty of Science**
**Choice Based Credit System (CBCS)**
**(W.e.f. June 2019)**

· **Title of the Course:** B.Sc. Part-I

· **Subject:** Zoology

· **Introduction:** This course provides a broad overview of Zoology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Zoology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

· **Objectives of the course:** The objectives of B. Sc. Zoology course are:

a. To provide an intensive and in depth learning to the students in field of Zoology.
b. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world.
c. To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students.
d. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

**Course outcome and Advantages :** Zoology has tremendous job potential.

a) The successful students will be able to establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc.
b) Scientific Research Organizations.
c) Universities in India & aboard.
d)

· **Eligibility and Admission:** A Candidate passing 10+2 with biology MLT , dairy science , Fisheries, Agricultural science as one of the subject and passed from state syllabus / CBSE / equivalent with minimum passing percentage of as per the directives of the higher education and Solapur university, Solapur.

· **Duration:** The duration for this program is of 3 years with semester pattern (06 Semesters)

· **Medium of Instruction:** English

· **Syllabus Structure:**

· The University follows semester system.
· An academic year shall consist of two semesters.
· Each B.Sc. course shall consist of three years i.e. six semesters.
· B.Sc. Part-I Zoology shall consist of two semesters: Semester I and Semester II.

In semester I, there will be two core papers is having paper I and paper II of 100 marks. Similarly in Semester II there will be two core papers is having paper I and paper II of 100 marks. English will be as Ability Enhancement Course (AECC) in both Semester I and II. English paper carries 100 marks in each semester.

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below. For B.Sc. Part-I Zoology sem I & II the internal assessment will be based on Internal tests, Home assignment, Tutorials, Seminars, Group discussion, Brain storming sessions etc. as

given below. Practical course examination is of 100 marks shall be conducted at the end of semester II. The practical examination of 100 marks shall also consist of 80 marks for University practical assessment and 20 marks for college internal assessment.

· **Scheme of Evaluation**

As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 20 marks.

**Semester – I:**

**Theory: (100 marks)**

University Examination (80 marks): No. of theory papers: 2 (paper I and paper II of 40 marks each )

**Internal Continuous Assessment: (20 marks and 10 marks each for two papers )**

(a) Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

**Semester – II**

**Theory: (100 marks)**

University Examination (80 marks): No. of theory papers: 2 (paper III and paper IV of 40 marks each)

**Internal Continuous Assessment: (20 marks and 10 marks each for two papers)**

(a) Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

**Practical Examination: (100 marks)**

University Examination (80 marks): No. of practical course: 1

**Internal Continuous Assessment: (20 marks)**

(a) Internal practical test - Scheme of marking: **10 marks**

(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior: **10 marks**

**Passing Standard**

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same 70 marks of external examination and his performance shall be scaled to 100 marks.

· **ATKT**

Candidate passed in all papers, except **5 (five)** papers combined together of semester I and II of B.Sc. Part-I Zoology examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Zoology

# B.Sc .I Semester-I & II, ZOOLOGY
# Choice Based Credit System (CBCS) Structure (2019-20)

## Semester- I (Theory)

| Paper | Title | Marks |
|---|---|---|
| I | Animal diversity-I ( Paper I ) | 50 (40- UA and 10-CA) |
| II | Animal diversity-II (Paper II) | 50 (40- UA and 10-CA) |

### Semester- II (Theory)

| Paper | Title | Marks |
|---|---|---|
| III | Comparative Anatomy of vertebrates ( Paper III ) | 50 (40- UA and 10-CA) |
| IV | Developmental Biology of vertebrates (Paper IV) | 50 (40- UA and 10-CA) |

### PRACTICAL AT THE END OF SEMESTER-II

| PRACTICAL | Title | Marks |
|---|---|---|
| I | Animal diversity I & II AND Comparative Anatomy of vertebrates and Developmental Biology of vertebrates | 100 (80 UA+20 CA) |

## SEMESTER – I

**CORE COURSE- I-** **(Total credits: 4)**

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**PAPER I: Animal Diversity- I**
**(Total credits 2.0, Contact Hrs 30.0)**

**Unit 1: Kingdom Protista** **3**
General characters and classification up to classes; locomotory organelle and locomotion in protozoa ,nutrition in protozoa.

**Unit 2: Phylum Porifera** **3**
General characters and classification up to classes; canal system in *Sycon*

**Unit 3: Phylum Cnidaria** **3**
General characters and classification up to classes; polymorphism in hydrozoa

**Unit 4: Phylum Platyhelminthes** **3**
General characters and classification up to classes; life history of *Taenia solium*

**Unit 5: Phylum Nemathelminthes** **4**
General characters and classification up to classes; life history of *Ascaris lumbricoides* and its parasitic adaptations

**Unit 6: Phylum Annelida** **3**
General characters and classification up to classes; metamerism in annelid, economic importance of annelids with reference to earthworm and leech

**Unit 7: Phylum Arthropoda** **4**
General characters and classification up to classes; vision in arthropoda, metamorphosis in insects, economic importance of insects.

**Unit 8: Phylum Mollusca** **3**
General characters and classification up to classes; torsion in gastropods
economic importance of molluscs

**Unit 9: Phylum Echinodermata** **4**
General characters and classification up to classes; water-vascular system in Asteroidea

Total- **30**

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**PAPER II: Animal Diversity- II**
**(Total credits 2.0, Contact Hrs 30.0)**

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**Unit 1: Protochordates** **3**
General features and phylogeny of protochordata

**Unit 2: Agnatha** **3**
General features of agnatha and classification of cyclostomes up to classes

**Unit 3: Pisces** **4**
General features and classification up to orders; economic importance of fishes

**Unit 4: Amphibia** **5**
General features and classification up to orders; parental care

**Unit 5: Reptiles** **5**
General features and classification up to orders; poisonous and non-poisonous snakes, types of snake venom, symptoms and treatments of snake bite

**Unit 6: Aves** **5**
General features and classification up to orders; flight adaptations in birds

**Unit 7: Mammals** **5**
General features and classification up to orders; adaptive radiation in mammals

**Total -30**

**References:**


- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.

- Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). *The Invertebrates: A New Synthesis*, III Edition, Blackwell Science

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.

- Pough H. *Vertebrate life*, VIII Edition, Pearson International.

- Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.

# SEMESTER – II

## CORE COURSE II- (Total credits: 4)

### PAPER III: COMPARATIVE ANATOMY OF VERTEBRATES
**(Total credits 2.0, Contact Hrs 30.0)**

**Unit 1: Integumentary System** **4**
Derivatives of integument with reference to glands and digital tips

**Unit 2: Skeletal System** **4**
Appendicular and axial skeleton in vertebrates

**Unit 3: Digestive System** **5**
Brief account of alimentary canal and digestive glands

**Unit 4: Respiratory System** **5**
Brief account of skin, gills, lungs, air sacs and swim bladder

**Unit 5: Circulatory System** **4**
Evolution of heart and aortic arches

**Unit 6: Urinogenital System** **4**
Succession of kidney, Evolution of urinogenital ducts

**Unit 7: Nervous System** **4**
Comparative account of brain

**Total - 30**

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## PAPER IV: DEVELOPMENTAL BIOLOGY OF VERTEBRATES

**(Total credits 2.0, Contact Hrs 30.0)**

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**Unit-I: Gametogenesis:** **03**

(a) Spermatogenesis and oogenesis with reference to mammals
(b) Vitellogenesis in birds and structure of hens egg

**Unit-II: Fertilization** **03**

(a) External fertilization in amphibians
(b) Internal fertilization in mammals
(c) General mechanism of fertilization in mammals

**Unit-III: Early Embryonic Development up to Gastrulation** **05**

(a) Cleavage, blastulation and gastrulation in frog
(b) Cleavage, blastulation and gastrulation in human
(c) Fate map of blastula in frog and human

**Unit-IV: Placenta in mammal** **04**

(a) Implantation of blastocyst in humans, human placenta and functions
(b) Types of placenta on the basis of histology

**Unit-V: Development and its Regulation** **05**

(a) Cellular differentiation: Definition, mechanism of differentiation
(b) Cellular movements: Epiboly, emboly and its significance in development
(c) Apoptosis: Definition, general mechanism and significance

**Unit-VI: General Topics in Embryology** **05**

(a) Metamorphosis in frog tadpole and its hormonal regulation
(b) Types of twins in human

**Unit-VII: Recent Developments in Human Embryology** **05**

(a) Principles and applications of ultrasound
(b) Causes of miscarriages

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**REFERENCES:**


- Kardong, K.V. (2005) *Vertebrates' Comparative Anatomy, Function and Evolution*. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). *Comparative Anatomy of the Vertebrates*. IX Edition. The McGraw-Hill Companies.
- Hilderbrand, M and Gaslow G.E. *Analysis of Vertebrate Structure*, John Wiley and Sons.
- Walter, H.E. and Sayles, L.P; *Biology of Vertebrates*, Khosla Publishing House.
- Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
- Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

# Practical Course in Zoology for B. Sc. I

**For both Semester I and II**

**(Credits 4)**

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**1.** Study of the following specimens (General characters and classification)
**CD/Model/Chart/Slides/Virtual**

- *Amoeba, Euglena, Plasmodium, Paramecium*
- *Sycon, Hyalonema, and Euplectella*
- *Obelia, Physalia, Aurelia, Metridium*
- *Taenia,, Ascaris, Fasciola*
- *Aphrodite, Nereis, Pheretima, Hirudinaria*
- *Peripatus, Palaemon, Crab, Limulus, Scolopendra, Julus, Periplaneta*
- *Chiton, Dentalium, Pila, Unio, Sepia, Octopus*
- *Pentaceros, Ophiura, Echinus, Cucumaria and Antedon,*
- *Balanoglossus, Herdmania, Branchiostoma*
- *Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla*
- *Ichthyophis, Salamandra, Bufo, Hyla*
- *Chelone,Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis*
- **Any six** common birds from different orders:
- *Ornithorhynchus, Pteropus, Rattus, Loris, Funambulus*

**2.** Study of the following permanent slides/lab.specimens:

(a) T.S. and L.S. of *Sycon*,
(b) *Taenia*- Scolex, mature & gravid proglottid
(c) Whole mount of male and female *Ascaris* and Liverfluke
(d) Observation and identification of protozoans, helminthes, arthropod vectors

**3.** Key for Identification of poisonous and non-poisonous snakes: Cobra & Rat Snake

(An "**animal album**" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.)

**4 . Osteology**: **CD/Model/Chart/Slides/Virtual CD**

a) Disarticulated skeleton of frog: Skull, Atlas, Typical Vertebra, Pectoral and Pelvic Girdle
b) Study of mammalian skulls: One herbivorous and one carnivorous animal

**5. Frog** - Study of developmental stages - whole mounts and sections through permanent slides – cleavage, blastula, gastrula, tadpole external and internal gill stages. **(CD/Model/Chart/Slides/Virtual CD)**

**6. Chick Embryology:** Study of chick egg and W.M. of embryonic stages: 24hrs, 33hrs, 48hrs, 72 hrs.

**6 Placenta:** Study of the different types of mammalian **placenta**- histological sections using permanent slides or Intact placenta of Rat / Human using laboratory material / photomicrographs./ **CD/Model/Chart/Slides/Virtual CD**

**7.** Examination of **gametes -** frog/rat - sperm and ova through permanent slides or photomicrographs./ **CD/Model/Chart/Slides/Virtual CD**

**8. Cytological Preparation:**

(a) Stained preparation of mitochondria using vital staining with suitable material
(b) Stained preparation of nucleus in blood smear using Leishman's stain
(c) Study of Osmosis: Effect of Isotonic, hypotonic and hypertonic solution on blood cells

**8) Study Tour /** – Visit to any suitable place of Zoological interest to study animal biodiversity / IVF and hospital Facility / Research Center and submission of report. **All necessary precautions must be taken while organizing study tour with reference to the safety of students.**

**(Or)**

A small project report or review article submission of any one topic related to any Ecological and Applied Zoological interest.

# Scheme of Marking for University Practical Examination

**Total Marks: 80**

| | | |
|---|---|---|
| Q.1. | Cytological preparation of mitochondria / nucleus **(any one)** | 10 |
| Q.2. | Effect of isotonic / hypotonic / hypertonic solution on blood cells **(any one)** | 10 |
| Q.3. | Spotting **(Five spots)**<br><br>(a) Identify & classify giving reasons<br>(b) Identify, sketch & label<br>(c) Identify & describe<br>(d) Identify & give evolutionary significance<br>(e) Identify & classify giving reasons | |
| Q.4. | Identification and explanation of mammalian placenta **(any one)** | 10 |
| Q.5. | Identification and explanation of:<br><br>(a) Any one bone: Identify, sketch & label<br>(b) Any one developmental stages of frog: Identify & explain<br>(c) Any one gamete of frog / rat: Identify, sketch & label<br>(d) Any one poisonous / non-poisonous snake: Identify & describe<br>(e) Any one of: canal system / parasite / W.M. of chick embryo: Identify & describe | 10 |
| Q.6. | Tour Report/ project report or review article submission | 10 |
| Q.7. | Laboratory Record (Journal) | 10 |
| Q8: | Viva –Voce (General) | 10 |

**B O S in Zoology**

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: Computer Science

## Name of the Course: B.Sc. I ( Sem–I & II )

**(Syllabus to be implemented from w.e.f. June 2019)**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**Faculty of Science**

**Choice Based Credit System (CBCS), (w.e.f.2019-20)**Structure for

# B. Sc-I (Computer Science)

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- I Semester – I** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English (communication skill) | Paper- I | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will be ELECTIVE Subjects.) | | **DSC 1A** | Paper-I **Fundamentals of Computer** | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II **Programming Using C-I** | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2A | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3A | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4A | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | | | | | | | | | |
| **Total** | | | | **24** | -- | -- | **500** | **400** | **100** | **20** |
| **Class :** | **B.Sc.- I Semester - II** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English (communication skill) | Paper- II | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will beELECTIVE Subjects.) | | **DSC 1B** | Paper-III **Introduction to Web Designing** | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV **Programming Using C - II** | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2B | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3B | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4B | | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 2.5 | -- | -- | 50 | 40 | 10 | |
| | Democracy, Elections and Good Governance | | 3.0 | | | 50 | 40 | 10 | NC |
| **Total (Theory)** | | | **27** | -- | -- | **550** | **440** | **110** | **20** |
| **Core** | DSC 1 A & 1B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 2 A & 2B | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 3A & 3B | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 4A & 4B | | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| **Total (Practical)** | | | | | **16** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | **51** | | **16** | **1450** | **1160** | **290** | **56** |

***Core Subjects**
**Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology**

**DSC 1A : Paper - I**

# Fundamentals of Computers

**Unit I**:-**Introduction to Computer** [10]

Introduction to computers, Evolution of personal computers; Generation of computers;Elements of a computer processing system- Hardware & Software, various categoriesof software; Computer organization Overview-CPU, I/O devices, storage devices andmedia; Various type of displays and other peripherals used in PCs.

**Unit II**:-**Operating System Concept** [10]

Introduction to Operating system, Purpose of Operating Systems, services andfeatures of OS, Types of Operating System, Components of OS.

Introduction to PC Operating Systems: - DOS, Windows operating System, Linuxoperating system, Concept and working with files and folders.

Introduction to Mobile Operating System: -Android, Windows, IOS, Symbian

**Introduction to Green IT:-**Environmental Impacts of IT, Holistic Approach to Greening IT, Green IT Standards and Eco-Labelling, Enterprise Green IT Strategy , Green IT: Burden or Opportunity?

Hardware:Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose

Software: Introduction, Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power.

**Unit III**:-**Microsoft Office** [20]

**Microsoft Word:-**Introduction to MS Word, opening, creating, saving, deletingdocument, page setting, formatting page, formatting text, adding images, Headerfooters, border and shading, bullets, mail merge, Table, graphics, label, Templates,Wizards and Printing Techniques.

**Microsoft Excel: -**Introduction to excel, File management in excel, operations relatedto workbook, formatting sheet, adding formulate and functions, charts and maps,data menu, view menu, work with multiple worksheets, importing and exporting ofdata.

**Microsoft PowerPoint:** Introduction and Applications of Power Point, create a NewPresentation, Adding Slides, Clip Arts, Smart art, Charts, Text, images and otherobjects, Templates and Master Slides, Giving Animation effects, Links and Actionbuttons

**Reference Books**


1. Computer Fundaments - P.K. Sinha.
2. Fundamental of computers - V. Raja Raman.
3. Computer Fundamentals- Anita Goel
4. Fundamentals of Information Technology - Chetan Srivastava.
5. Computer Fundamental -B. Ram
6. San Murugesan, G. R. Gangadharan: Harnessing Green IT,WILEY 1st Edition-2013

**DSC 1A : Paper - II**

# Programming Using C-I

**Unit I**:-**Introduction to Programming** [8]

Programming languages (Machine Languages, Assembly Languages, High levellanguages), Compiler, Assembler, Interpreter.

Planning the Computer Program: Concept of problem solving, Problem definition,Program design, Debugging, Types of errors in programming, Documentation.,Concept of Algorithm, Characteristics, Notation of Algorithm, Designing AlgorithmsWriting step by step procedure,

Flowcharts- Definition, Symbol, features,representation in terms of Flow chart, Advantages and Limitations of Flow Charts,Pseudo code generation, Tracing, Testing,

**Unit II**:-**Introduction to 'C'** [16]

History, Features of C, Structure of 'C' programming, C-Tokens, Data types,Operators, Control Statements-Conditional control statements, Looping, Unconditionalcontrol statements

**Unit III**: -**Arrays and String** [16]

Array definition and declaration, Types of array, Accessing Array, array manipulation,searching, insertion, deletion of an element from an array, basic matrix operations,dynamic array, String-Declaration and Initialization of String, operation on string,inbuilt String handling functions, arithmetic operation on string, table of string.

**References**

1. Let us C- Y. C. Kanetkar
2. C programming- Dennis Ritchie
3. Programming in C- Goterfried
4. Programming in C – E. Balagurusamy

**DSC 1B : Paper - III**

# Introduction to Web Designing

**Unit I:- Overview of HTML & HTML5** **[12]**

Introduction to Networking, Network topology, LAN, MAN, WAN, Introduction toInternet, Requirement for Internet.

Introduction to HTML, Overview of basic HTML , Structure of HTML, Creating andopening HTML file, Singular and paired tags, Text formatting tag, Anchor tag, Lists,Image, Image Map, Table, Frames and Frameset, HTML5: Introduction to HTML5, Need of HTML5, DOCTYPE Element, Tags-Section,Article, aside, header, footer, nav, dialog, figure etc. Events in HTML5, Input tag (Type,Auto focus, placeholder, required etc. attributes.) in HTML5, Graphics in HTML5,Media tags in HTML5

**Unit II:- Introduction to CSS** **[8]**

Introduction to CSS, Use of CSS, Types of CSS, Selectors, Properties, Values.

CSS Properties: - Background, Text, Fonts, Link, List, Table, Box Model, Border,Margin, Padding, Display, Positioning, Floating, Opacity, Media type, Backgroundsand Borders Image, Values and Replaced Content, Text Effects,2D/3D, Transformations, Animations, Multiple Column Layout, User Interface, CSS interactwith JavaScript.

**Unit III:- JavaScript** **[20]**

Introduction to JavaScript, JavaScript Variables & Data types, Operators, Built infunctions in JavaScript Control structure in JavaScript, DOM, Math, Array, History,Navigator, Location, Windows, String, Date, Document objects, user defined function,Validation in JavaScript, event & event handling in JavaScript.

**Reference Books:-**

1. HTML5 Black Book Kogent Learning Solutions IncDreamtech.
2. Beginning JavaScript and CSS Development with jQuery Richard York.
3. Beginning HTML and CSS Rob Larsen.
4. HTML_&_CSS_The_Complete_Reference Thomas A. Powell.(Fifth Edition).

**DSC 1B : Paper - IV**

# Programming Using C-II

**Unit I**: -**Function and Pointer** [16]

Definition, declaration, function prototypes, Local and global variables, User definedfunctions, recursion, passing array and string to function, Storage classesPointers-Definition and declaration, Operation on pointer, Pointer initialization,Pointer and function, Pointer and array, Pointer of pointer, Call by value and Call byreference, Dynamic memory allocation

**Unit II**: -**Structures and Union** [10]

Definition and declaration, copying and comparing of structure, Array of structures, Passing structure to function, Pointer to structure, Nested structure, self-referential structure, Size of and type def, Definition and declaration of union, difference betweenstructure, union and array.

**Unit III**:-**File Handling** [14]

Defining, opening and closing of file, operations on file, Standard input and outputfunctions, formatted input and output functions, File opening modes, Errorhandling, Random access of file, command line argument.
Macros and Preprocessing-Features of C preprocessor, Macro – Declaration,Expansion, File Inclusion
Graphics using C - VDU Basics, Simple library functions-getpixel, putpixel, line,rectangle, circle, ellipse, arc etc.

Reference Books:-

1. Let us C- Y. C. Kanetkar
2. C programming- Dennis Ritchie
3. Programming in C- Goterfried
4. Programming in C – E. Balagurusamy

## DSC 1A and 1B : Practical - I and Practical - II

1. Demonstration of peripherals
2. DOS – external and internal commands, batch files commands
3. Windows Operating System –
4. Windows explorer, program manager, control panel, printmanager, Creating folders, files, icons, shortcuts
5. MS – WORD – Creating new documents, typing, deleting, selecting text,undo, Redo, formatting text – auto format, formatting characters, dropcaps, Paragraphs, line spacing, margins, page setup, headers and footersWriter's tools – spelling checker, auto format, auto correct, find andreplace Mail merge – Data source, Main document, creating mail mergedocument.
6. MS – EXCEL - Creating worksheet, Graphs, resizing graphs, formulas, ifStatement, types of functions
7. MS-Powerpoint-Creating presentation, slideshow, adding slides, insertingclip arts, smart art, images, sound files, linking etc.
8. Internet – creating e – mail accounts, browsing.
9. Design HTML page to display student Information
10. Design HTML page for all lists.
11. Design HTML page for Image map, table, frameset tags.
12. Create a web page using the Internal/Linked/External style sheet usingText formatting properties, CSS Borders, Margin Properties, Colorproperties, Use DIV and SPAN tag properties.
13. Write a JavaScript code working with functions: the alert Box, theconfirm Box , the prompt Box etc.
14. Solve Following program using JAVA Script to check given number is
    a. even or odd
    b. Prime or not
    c. palindrome or not.
    d. perfect or not
15. Write a JavaScript code block using objects: String Object, BooleanObject, Number Object, Date Object, Math Object, Window Object,Navigator Object, History Object, Screen Object, Location Object etc.
16. Write a Program to convert the Temperature in centigrade degree to theFahrenheit degree.
17. check whether given number is even or odd.
18. Write a program to find out First Fifty Prime numbers.
19. Write a program to find GCD & LCM of given number.
20. Write a program to convert given Binary number into its Octal / Decimal,Hexadecimal Equivalent.
21. Write a program to display Fibonacci series.

22. Write a Recursive function to find out the Factorial of Given Number.
23. Write a program to remove blank lines from a file.
24. Write a program to count the no. of words in a given text file.
25. Write a program to reverse the given number.
26. write a program to calculate Matrix Addition, Multiplication usingFunctions as well as without Functioning.
27. Write a program to find given string is Palindrome or not using function.
28. Write a program that accepts the Roll No, Name, Marks obtained in threetests of 'N' students & display the total and Average in tabular format.
29. Write a program to accepts two alphabets and pass them to the Functionvia Pointers Which checks for type of these alphabets. If both alphabetsare Vowels then function should return to the calling function, theirprevious alphabets. If both alphabets are Constant then function shouldreturn their successor alphabets.
30. Write a program which uses simple graphics functions.
31. Write a program to add two Matrices; Use two Dimensional array asPointer & Dynamic Memory allocation.
32. Write a program to input 10 names each of the length at least 8 characters' sort them in a alphabetical order.
33. Write a program to demonstrate macro substitution.
34. Write a program to demonstrate file inclusion mechanism.

## Abbreviations :

L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: Mathematics

# Name of the Course: B.Sc. I (Sem.–I & II)

**(Syllabus to be implemented from w.e.f. June 2019)**

## 1) Preamble

B.SC I Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology.Also logical development of various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things.In the theory courses of Algebra ,Calculus , Geometry , & Differential Equation.

Various deductions of theorems, corollaries and lemmas will be acquired by Students. Change is the Universal truth of the nature .So our aim is that Students should learn various techniques to find solutions . Students who opted F.Y.B.SC Mathematics have to complete 1 theory courses 1 each semester , one practicals entitled ( Numerical Techniques in Laboratory ) NTL [DSC- I A+I B] Courses (Annual). In the practical course of 100 marks students exercise the problem solving techniques for practical course . The details are mentioned in the syllabus.

## 2) Aims

The aim of the course is to generate Intelligent and Skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To include conceptual understanding in basic Phenomena , statements, theorems and development of appropriate problem solving skills suitable for applications and sufficient logical connectivity is provided.

## 3) Objective of the Course

1) To design the syllabus with specific focus on key Learning Areas .

2) To equip student with necessary fundamental concepts and knowledge base

3) To develop specific problem solving skills.

4) To impart training on abstract concepts, analysis, deductive techniques.

5) To prepare students for demonstrating the acquired knowledge.

6) To encourage student to develop skills for developing innovative ideas .

7) A student be able to apply their skills and knowledge that is translate information presented verbally into mathematical form select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion .

8) A Student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Science: B.Sc. I

**Choice Based Credit System (CBCS),(w.e.f.2019-20) Structure for B. Sc.-I**

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- I Semester – I** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English(communication skill) | Paper- I | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will be ELECTIVE Subjects.) | | DSC 1A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| **Total** | | | | **24** | -- | -- | **500** | **400** | **100** | **20** |
| **Class :** | **B.Sc.- I Semester - II** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English(communication skill) | Paper- II | 4.0 | | | 100 | 80 | 20 | 4.0 |
| **Core** (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will beELECTIVE Subjects.) | | DSC 1B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | Democracy, Elections and Good Governance | | 3.0 | | | 50 | 40 | 10 | NC |
| **Total (Theory)** | | | | **27** | -- | -- | **550** | **440** | **110** | **20** |
| **Core** | | DSC 1 A & 1B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | DSC 2 A & 2B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 3A & 3B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSC 4A & 4B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| **Total (Practical)** | | | | | **16** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | **51** | | **16** | **1450** | **1160** | **290** | **56** |

***Core Subjects**

**Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology**

# Equivalent Subject for Old Syllabus

## Sem. - I

| Sr. No. | Name of the old Paper | Name of the new Paper |
|---|---|---|
| 1 | Paper-I : Algebra | Paper-I : Algebra |
| 2 | Paper-II : Calculus | Paper-II : Calculus |

## Sem.-II

| Sr. No. | Name of the old Paper | Name of the new Paper |
|---|---|---|
| 1 | Paper-III : Geometry | Paper-III : Geometry |
| 2 | Paper-IV : Differential Equation | Paper-IV : Differential Equation |

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Semester Pattern

## Choice Based Credit System (CBCS) Syllabus

## B.Sc.I

## Mathematics

## (w.e.f. June-2019)

### Details of Re-Draft Syllabus of B. Sc. Part-I (MATHEMATICS)

### Semester-wise pattern (Commencing from JUNE– 2019)

B.Sc. I (Mathematics) (Honors) semester-wise Choice Based Credit System [CBCS] pattern to be implemented from June 2019. This syllabus of Mathematics carries 300 marks. In semester –I Internal examination (college examination) of 10 marks and external examination (university examination) of 40 marks [Total 40 +10 =50] for Theory paper –I & for paper II each, also in semester – II for Theory paper –III & for paper IV each and at the end of second term for **Numerical Technique Laboratory** [**NTL – I] [DSC-I A+ I B]** will be held. The distribution of marks is as follows.

**Semester –I (DSC-I A)**

**(1) Paper-I: ALGEBRA** **(Marks 40+10 = 50)**

**(2) Paper-II: CALCULUS** **(Marks 40+10 = 50)**

**Semester –II (DSC-I B)**

**(3) Paper -III: GEOMETRY** **(Marks 40+10 = 50)**

**(4) Paper-IV: DIFFERENTIAL EQUATIONS** **(Marks 40+10 = 50)**

**(5) Numerical Technique Laboratory** [**NTL - I**] [**DSC- I A + I B**] **(Marks 80 +20 =100)**

Internal exam of 20 marks and annual examination of 80 marks on all the above two papers.

**Note:-**

(1) Total teaching periods for Paper –I / Paper –II and for Paper –III / Paper –IV are five (5) per week for each semester.

(2) Total teaching periods for [DSC- I A+I B ] are four(4) per week for whole class as one batch.

**Duration of Annual Examination:**

(i) For Paper –I /II (Three hours ) in semester -I
(ii) For Paper –III/IV (Three hours ) in semester -II
(ii) For NTL –I [DSC- I A+ I B] (Three hours for a batch of 20 students) annually.

# Semester -I

## Paper –I : Algebra 30 Periods

**Unit 1 (A): Matrices :** Symmetric and Skew symmetric, Elementary transformations, Rank of a Matrix(Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. **[8]**

**Unit 1(B): Linear Equations:** Application of matrices to a system of linear (both Homogeneous and non-homogeneous) equations, Eigen values and Eigen vectors. **[7]**

**Unit 2(A): Complex Number:** Modulus and Argument of a Complex Number, DeMoivre's Theorem and its applications, Roots of Unity, Roots of Complex Numbers. **[8]**

**Unit 2(B) : Transcendental Functions :** Circular Functions and their inverses and Hyperbolic Function of a complex variable with their inverses. **[7]**

## Paper –II: Calculus 30 Periods

**Unit. 1 (A) : Differentiation:** Indeterminate forms and L' Hospital's Rule, Successive differentiation ,$n^{th}$ derivatives of standard functions, Leibnitz rule.Taylor's theorem and Maclaurin's Theorem (Only Statements). Series expansions of $e^x$, cos x, sin x, $(1+x)^n$ , log(1+x) **[8]**

**Unit. 1 (B) : Function of two variables:** Limit and Continuity of function of two variables , Partial derivative, partial derivative of higher orders, Homogeneous functions, Euler's Theorem on Homogeneous functions. **[7]**

**Unit. 2 (A) : Reduction Formulae:**

$\int_0^{\pi/2} sin^n x\, dx$ $\int_0^{\pi/2} cos^n x\, dx$ $\int_0^{\pi/2} sin^n x cos^m x\, dx$

(Note that reduction to these forms are not expected) **[7]**

**Unit. 2 (B) : Vector Calculus:** Scalar point function , Vector point function , Directional derivatives , divergence and Curl and its properties. **[8]**

# Semester -II

## Paper –III: Geometry 30 Periods

**Unit 1(A):-Change of Axis:** Translations, Rotations, Invariants, and Identifications of conics from

General form of second degree equations, Polar Coordinates, Conversion formulae. **[7]**

**Unit 1(B): Sphere:** Centre radius form, General form, Diameter form, Equation of Tangent

Plane and condition for tangency, Family of spheres $S+\lambda S'=0$, $S+\lambda P=0$. **[8]**

**Unit 2:-Plane:** General equation of plane, Normal equation, Intercept form Angle between two planes, Plane through three points, Plane through a given point, Sides of a

Plane, Distance of a point from a plane, Family of planes. **[15]**

## Paper- IV : Differential Equation 30 periods

**Unit 1(A):- Differential Equations of first order and first degree :[Part-I]**

Variables separable, Homogeneous, non- homogeneous differential Equations. [**7]**

**Unit 1(B):- Differential Equations of first order and first degree: [Part-II]**

Exact differential equations. Necessary and sufficient condition for exactness, Integrating

Factor with four rules, Linear differential equations of the form: $dy/dx+py=Q$; Bernoulli's Equation $dy/dx+Py=Qy^n$. [**8]**

**Unit 2(A) :- Linear Differential Equations With Constant Coefficients :[Part-I]**

Complementary function and particular integral, General solution of $f(D)\,y=X$, Solution

Off $(D)y=0$ for non-repeated , repeated, real and complex root. **[7]**

**Unit 2(B) :- Linear Differential Equations With Constant Coefficients : [Part-II]**

Solution of $f(D)y=X$ , where X is of the form

$e^{ax}$, sin(ax), cos(ax), $x^m$ , $e^{ax}V$, $xV$ **[8]**

## Numerical Technique Laboratory [NTL –I] [DSC – I A+I B]

**4 Periods per week.**

**Assignment –1:** Inverse of Matrix by Cayley-Hamilton Method.

**Assignment –2:** Solution of system of Linear Homogeneous Equation

**Assignment –3:** Solution of system of linear non-homogeneous Equation.

**Assignment –4:** n $^{th}$ roots of a complex number.

**Assignment –5:** Leibnitz Rule

**Assignment –6:** Reduction formulae

**Assignment– 7:** Partial differentiation

**Assignment –8:** Numerical examples on gradient, divergence and curl.

**Assignment – 9:** Change of axis and invariants.

**Assignment –10:** Conversion between Polar and Cartesian of points and equations

**Assignment –11:** Family of Planes.

**Assignment –12:** Family of Spheres.

**Assignment – 13:** Linear differential equations.

**Assignment –14:** Particular Integrals of $\mathbf{e^{ax}}$ **and** $\mathbf{x^m}$ .

**Assignment –15:** Particular Integrals of **sin (ax) and cos (ax).**

**Assignment –16:** Particular Integrals of $\mathbf{e^{ax}V}$, **xV**.

# References

**Paper -I: Algebra** **Paper -II : Calculus**

**Paper – III: Geometry** **Paper -IV : Differential Equation**


1. **ALGEBRA, B. Sc. – I (Semester –I) MATHEMATICS- Paper-I by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **July 2014**) **ISBN 978-93- 5164-169-8.**

2. **CALCULUS, B. Sc. – I (Semester –I) MATHEMATICS- Paper-II by Prof. S. J. Alandkar**, Prof. N.I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **July 2014**) **ISBN 978- 93-5164-162-9.**

3. **GEOMETRY, B. Sc. – I (Semester –II) MATHEMATICS- Paper-III by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **November 2014**)**ISBN 978-93-5164-339-5.**

4. **DIFFERENTIAL EQUATION , B. Sc. – I (Semester –II) MATHEMATICS- Paper-IV by Prof. S. J. Alandkar**, Prof. N. I. Dhanshetti, Prof. Dhone A. S. Prof. R. D. Mahimkar, Nirali Prakashan (Edition- **December 2014**) **ISBN 978-93-5164-445-3.**

5. **Algebra and Geometry by R. B. Kulkarni, J. D. Yadav, S. J. Alandkar, N. I. Dhanshetti. (SUMS Publication) B.Sc.-I Paper-I**

6. **Algebra and Geometry (B.Sc.-I Paper-I ) by Dr. B. P. Jadhav , Prof.A.M.Mahajan ,Prof.S.P.Gade, Prof. Kokare B.D . [Phadke Prakashan]**

7. **Text Books of Matrices by Shanti Narayan.**

8. **A Text Book of Analytical Geometry of Two dimensions, by P. K. Jain and Khalil Ahmid , Wiley Eartern Ltd. 1994.**

9. **Calculus and Differential Equations (B.Sc. –I ,Paper –II)**

10. **Calculus and Differential Equations (B. Sc. I , Paper- II) by Dr. B. P. Jadhav , Prof.A.M.Mahajan , Prof.S.P.Gade, Prof. Kokare B.D . [Phadke Prakashan]**

10.
11. **Differential Calculus by Shanti Narayan**

12. **A text book of Vector Calculus , by Shanti Narayan.**

13. **Differential equations, by G. S. Diwan, D. S. Agashe. Popular Prakashn , Bombay.**

14. **Introductory course in Differential Equation by D. A. Murray Orient Longman**


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**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

# Name of the Faculty: Science and Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: BOTANY

## Name of the Course: B.Sc. I (Sem-I&II)

**(Syllabus to be implemented from w.e.f. June 2019)**

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| Class : | B.Sc.- I Semester – I | | | | | | | | | |
| Ability Enhancement Course(AECC) | | English(communication skill) | Paper- I | 4.0 | | | 100 | 80 | 20 | 4.0 |
| Core (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will be ELECTIVE Subjects.) | | DSC 1A Microbiology, Phycology | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Fungi, Archegoniate | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4A | Paper-I | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-II | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | | | | | | | | | |
| Total | | | | 24 | -- | -- | 500 | 400 | 100 | 20 |
| Class : | B.Sc.- I Semester – II | | | | | | | | | |
| Ability Enhancement Course(AECC) | | English (communication skill) | Paper- II | 4.0 | | | 100 | 80 | 20 | 4.0 |
| Core (*Students can opt any Four Subjects from the Twelve Subjects Listed below. Out of these Four Subjects One Subject will be CORE and other Three will beELECTIVE Subjects.) | | DSC1B Plant Ecology | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | Taxonomy of Angiosperms | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | DSC 4B | Paper-III | 2.5 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-IV | 2.5 | -- | -- | 50 | 40 | 10 | |
| | | Democracy, Elections and Good Governance | | 3.0 | | | 50 | 40 | 10 | NC |
| Total (Theory) | | | | 27 | -- | -- | 550 | 440 | 110 | 20 |
| Core | | DSC 1 A & 1B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 2 A & 2B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 3A & 3B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | | DSC 4A & 4B | Practical I and II | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| Total (Practical) | | | | | | 16 | 400 | 320 | 80 | 16 |
| Grand Total | | | | 51 | | 16 | 1450 | 1160 | 290 | 56 |

# Core Subject : Botany

## PUNYASHLOK AHILYADEVI HOLKAR

## Solapur University, Solapur

### Faculty of Science

### Choice Based Credit System (CBCS) (w.e.f.2020-21)

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- II Semester – III** | | | | | | | | | |
| **Core** (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR | | DSC 1C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | AECC - Environmental Studies | | 3.0 | -- | -- | - | - | - | NC |
| | | SEC-1 | | 2.5 | | | 50 | 40 | 10 | 2.0 |
| **Grand Total** | | | | **23.5** | -- | -- | **350** | **280** | **70** | **14** |
| **Class :** | **B.Sc.- II Semester – IV** | | | | | | | | | |
| **Core** (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe Elective Subject | | DSC 1D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | SEC-2 | | 2.5 | | | 50 | 40 | 10 | 2.0 |
| **Total (Theory)** | | | | **20.5** | -- | -- | **350** | **280** | **70** | **14** |
| **DSE (Practical )** | | DSC 1C & 1D | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | | DSC 2C & 2D | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | | DSC 3C & 3D | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| **Total (Practical)** | | | | | | **24** | **300** | **240** | **60** | **12** |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Grand Total** | | | **43.5** | | **24** | **1000** | **800** | **200** | **40** |

**Draft Structure for B. Sc-II**

**Core Subject : Botany**

# PUNYASHLOK AHILYADEVI HOLKAR

**Solapur University, Solapur**

**Faculty of Science**

**Choice Based Credit System (CBCS)**

**(w.e.f.2021-22)**

## Draft Structure for B. Sc-III

| **Subject/ Core Course** | **Name and Type of the Paper** | | **No. of papers/ Practical** | **Hrs/week** | | | **Total Marks Per Paper** | **UA** | **CA** | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Type** | **Name** | | **L** | **T** | **P** | | | | |
| **Class :** | **B.Sc.- III Semester – V** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | English (Business English) | Paper- III | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **Discipline Specific Elective (DSE)** (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II. | | DSE-1A | Paper- IX | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | DSE- 2 A | Paper -X | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | DSE- 3 A | Paper- XI | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | DSE- 4 A | Paper- XII | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | SEC- 3 | | 2.5 | -- | -- | 50 | 40 | 10 | 2.0 |
| **Grand Total** | | | | **18.5** | **--** | **--** | **550** | **440** | **110** | **22** |
| **Class :** | **B.Sc.- III Semester –VI** | | | | | | | | | |
| Ability Enhancement Course(AECC) | | English (Business English) | Paper IV | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **DSE** (Students can opt any one | | DSE- 1B | Paper -XIII | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | DSE- 2B | Paper- XIV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| subjects among the three<br>Subjects excluding interdisciplinary offered at B.Sc. II. | | | | | | | | | |
| | DSE- 3 B | Paper- XV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | DSE- 4 B | Paper- XVI | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| SEC | SEC- 4 | | 2.5 | -- | -- | 50 | 40 | 10 | 2.0 |
| **Total (Theory)** | | | **18.5** | **--** | **--** | **550** | **440** | **110** | **22** |
| **DSE ( Practical Annual Exam)** | DSE- 1 A&B | Practical- IX & XIII | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSE -2 A&B | Practical- X&XIV | -- | -- | 4 | 100 | 80 | 20 | 4.0 |
| | DSE- 3 A&B | Practical- XI&XV | | | 4 | 100 | 80 | 20 | 4.0 |
| | DSE- 4 A& B | Practical- XII & XVI | | | 4 | 100 | 80 | 20 | 4.0 |
| **Total (Practicals)** | | | | | **24** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | **37.5** | | **24** | **1500** | **1200** | **300** | **56** |

## Summary of the Structure of B.Sc. Programme

## as per CBCS pattern

| Class | Semester | Marks-Theory | Credits-Theory | Marks-Practical | Credits-Practicals | Total – credits |
|---|---|---|---|---|---|---|
| B.Sc.-I | I | 500 | 20 | -- | -- | 20 |
| | II | 550 | 20 | 400 | 16 | 36 |
| B.Sc.-II | III | 350 | 14 | -- | -- | 14 |
| | IV | 350 | 14 | 300 | 12 | 26 |
| B.Sc.-III | V | 550 | 22 | -- | -- | 22 |
| | VI | 550 | 22 | 400 | 16 | 38 |
| Total | | 2850 | 112 | 1100 | 44 | 156 |

B.Sc. Programme:

Total Marks : Theory + Practical's = 2850 +1100 =3950

Credits : Theory + Practical's = 112 + 44 = 156

Numbers of Papers Theory: Ability Enhancement Course (AECC) : 05

Theory: Discipline Specific Elective Paper (DSE) : 08

Theory: DSC : 14

Skill Enhancement Courses : 04

Total : Theory Papers : 31

: Practical Papers : 11

## Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Course

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

**PUNYASHLOK AHILYADEVI HOLKAR**

**Solapur University, Solapur**

**Faculty of Science**

**Choice Based Credit System (CBCS), (w.e.f June.2019-20)**

**Structure for B. Sc-I**

***Core Subjects: Botany**

# Objective and Outcome of the Course
# Syllabus of B. Sc.-I, CBCS Pattern
# Botany, w.e.f. June-2019

**DSC -1-A**

## Semester- I

## Paper No-I: Microbiology and Phycology

**Unit 1**: **Introduction of Microbiology**

**Objective:** To get the knowledge about the basic concepts in microbiology

**Outcome:** The student can understand the basic concept of microbiology

**Unit 2: Microbes**

**Objective:** To get the knowledge about the characters, structure and economic importance of viruses. Knowledge about the forms, size and diversity of bacteria and about the Mycoplasma

**Outcome:** The student can understand in detail about the viruses, diversity of bacteria and about the Mycoplasma

**Unit 3: Phycology**

**Objective:** To get the knowledge about the characters, classification and economic importance of algae

**Outcome:** The student can understand importance of algae

**Unit:4: Cyanophyta**

**Objective:** To get the knowledge about the general Characters, occurrence, classification, Thallus organization & reproduction of Cyanophyta division along with the example *Nostoc*

**Outcome:** The student can understand in detail about the division Cyanophyta along with its one detailed example of *Nostoc*

**Unit 5: Chlorophyta**

**Objective:** To get the knowledge about the general Characters, occurrence, classification, Thallus organization & reproduction of chlorophyta division along with the example *Nostoc*

**Outcome:** The student can understand in detail about the division chlorophyta along with its one detailed example of *Spirogyra*

# Paper -II
# Fungi and Archegoniate

**Unit 1: Fungi**

**Objective:** To get the knowledge about characters, mode of nutrition & classification of the True fungi.

**Outcome:** The student can understand about the general introduction of true fungi.

**Zygomycotina**

**Objective:** To get the knowledge about the fungal division Zygomycotina

**Outcome:** The student can understand about division of Zygomycotina.

**Ascomycotena**

**Objective:** To get the knowledge about the fungal division Ascomycotina.

**Outcome:** The student can understand about the division of Ascomycotina

**Unit 2: Archegoniate**

**Objective:** To get Knowledge about Introduction & general characters of Archegoniate

**Outcome:** The student get an detailed idea about Archegoniate

**Unit 3: Bryophytes**

**Objective:** To get the knowledge about the Bryophytes with suitable example

**Outcome:** The student can understand about the Bryophytes and life cycle of ***Riccia*** with its economic importance.

**Unit 4: Pteridophyta**

**Objective:** To get the knowledge about the Pteridophytes with suitable example.

**Outcome:** The student can understand about the Pteridophytes and life cycle of ***Selaginella*** with its economic importance**..**

**Unit 5: Gymnosperms**

**Objective:** To get the knowledge about the Gymnosperms with suitable example

**Outcome:** The student can understand about the Gymnosperms and life cycle of ***Cycas*** with its economic importance.

## Paper No. III

## Plant Ecology

**Unit 1: Introduction**

**Objective:** To get the knowledge about the climatic and Edaphic factors of environment

**Outcome:** The student can understand about the Climatic and Edaphic factors of environment.

**Unit 2: Ecological Adaptations**

**Objective:** To get the knowledge about the Ecological adaptations.

**Outcome:** The student can understand about the Ecological adaptations in plants.

**Unit 3: Plant communities**

**Objective:** To get the knowledge about the Forms & structure of community along with Qualitative and quantitative characters of community

**Outcome:** The student can understand about the Plant communities

**Unit 4: Ecology**

**Objective:** To get the knowledge about Introduction, Components of ecosystem, Ecological pyramids with Food chain and food webs.

**Outcome:** The student can understand about the concepts of ecology

**Unit 5: Ecological succession**

**Objective:** To get the knowledge about the Ecological succession

**Outcome:** The student can understand about the Ecological succession

## PAPER IV

## Taxonomy of Angiosperms

**Unit 1: Introduction**

**Objective:** To get knowledge about different concepts in taxonomy

**Outcome:** The student can understand about importance of taxonomy

**Unit 2: Classification**

**Objective:** To understand different classification systems and its merit & demerits

**Outcome:** The student can understand about classification systems in taxonomy

**Unit 3: Identification and nomenclature**

**Objective:** To understand Identification methods, Nomenclature, Principles and Rules of ICBN

**Outcome:** The student can understand different methods of classification and rules of nomenclature

**Unit 4: Herbarium and Botanical Garden**

**Objective:** To understand technique of herbarium preparation and significance

**Outcome:** The student can understand technique and botanical gardens in India

**Unit 5: Study of Angiosperm families**

**Objective:** To study morphological & reproductive characters of 4 families

**Outcome:** The student can understand detailed identifying characters of family

# Botany, w.e.f. June-2019

## DSC -1-A

## Semester- I

## Paper No-I: Microbiology & Phycology

## Microbiology & Phycology (Lecture 35)

| | | | |
|---|---|---|---|
| **Unit-1** | **:** | Introduction of microbiolo | (02 lecture) |
| **Unit-2** | | **Microbes** | (09 lectures) |
| **2.1** | | **Viruses:** General characters, structure, classification (plant viruses) and economic importance of viruses. | |
| **2.2** | | **Bacteria:** General characters of bacteria, structure and Economic importance. | |
| **2.3** | | **Mycoplasma:** General characters, Structure, classification and significance. | |
| **Unit-3** | | **Phycology** | (09 lectures) |
| **3.1** | | Introduction, general characters and classification of algae (As per Smith-1955) up to class. | |
| **3.2** | | Economic importance of Algae | |
| **Unit-4** | | **Cyanophyta** | (07 lectures) |
| **4.1** | | General Characters | |
| **4.2** | | Study of ***Nostoc*** – Occurrence, Classification, thallus structure and reproduction. (excluding developmental stages) | |
| **Unit-5** | | **Chlorophyta** | (08 lectures) |
| **5.1** | | General Characters | |
| **5.2** | | Study of ***Spirogyra*** - Occurrence, Classification, thallus structure and reproduction (excluding developmental stages) | |

**References Book**


1. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
2. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, Mc Graw Hill, India. 6th edition.
3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
5. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
6. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata Mc Graw-Hill Co, New Delhi.


## Paper-II: Fungi & Archegoniate

# Fungi & Archegoniate (Lecture 35)

| | | |
|---|---|---|
| **Unit-1** | **Fungi** | (08lecture) |
| **1.1** | General characters, Nutrition and classification of fungi up to class (as per Ainsworth). | |
| **1.2** | Economic importance of Fungi | |
| **1.3** | Study of *Mucor* - Occurrence, Thallus organisation, classification and Life cycle. (excluding developmental stages) | |
| **1.4** | Study of Yeast-Occurrence, Thallus organization, classification and life cycle. (excluding developmental stages) | |
| **Unit 2** | **Archegoniate** | (04 Lectures) |
| **2.1** | Introduction | |
| **2.2** | General characters. | |
| **Unit 3** | **Bryophytes** | (07 Lectures) |
| **3.1** | General characters, and Classification (as per G. M. Smith) | |
| **3.2** | Study of *Riccia*- Occurrence, classification, thallus structure (External and Internal) and reproduction (Excluding development). | |
| **3.3** | Economic importance of Bryophytes | |
| **Unit 4** | **Pteridophytes** | (8 Lectures) |
| **4.1** | General characters and classification up to class (as per G. M. Smith) | |
| **4.2** | Study of *Sellaginella*- Occurrence, classification, morphology of sporophyte, anatomy (stem) and reproduction (Excluding development). | |
| **4.3** | Economic importance of Pteridophyte | |
| **Unit 5** | **Gymnosperms** | (08 Lectures) |
| **5.1** | General characters and classification (As per Sporne) | |
| **5.2** | Study of *Cycas*- Occurrence, classification, morphology (Sporophyte, Corolloid root), anatomy of leaflet and reproduction of *Cycas* (Structure of male and female reproductive structures excluding development). | |
| **5.3** | Economical importance of Gymnosperms | |

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1. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
2. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
3. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central Book Depot. Allahabad.
4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill, Delhi.
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7. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
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R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
16. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

# Syllabus of B. Sc.-I, CBCS Pattern
# Botany, w.e.f. June-2019
## DSC -1-A
## Semester- II

## Paper No-III: Plant Ecology

## Plant Ecology (Lecture 35)

**Unit 1: Introduction** (05 Lectures)

**1.1.** Climatic factor- Light, Temperature, Humidity, Wind & Rainfall.

**1.2.** Edaphic factor- Soil formation, Soil profile, Classification & Chemical properties of soil.

**Unit 2: Ecological Adaptation** (8 Lectures)

**2.1.** Introduction.

**2.2.** Hydric Adaptation.

**2.3.** Xeric Adaptation.

**Unit 3: Plant communities** (8 Lectures)

**3.1.** Introduction.

**3.2.** Forms & structure of community.

**3.3.** Classification.

**3.4.** Qualitative and quantitative characters of community

**Unit 4: Ecosystem** (8 Lectures)

**4.1.** Introduction.

**4.2.** Concept & type.

**4.3.** Components of ecosystem.

**4.4.** Ecological pyramids.

**4.5.** Food chain and food webs.

**Unit 5: Ecological succession** (6 Lectures)

**5.1.** Introduction.

**5.2.** Concept & process.

**5.3.** Hydrosere and Xerosere.

**References;**


1.Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.

2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.

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5. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi.

6. Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.

7. Mackenzie, A. et al. 1999. Instant Notes in Ecology. Viva Books Pvt. Ltd., New Delhi.

8. Ashok Bendre / Ashok Kumar Economic Botany Rastogi Publications Shivaji Road, Meerut – 250002 India.

9. Prof. M.A. Khan – Environment, Biodiversity and Conservation S-B Nangia, A.P.H. Publishing Corporation, 5, Ansari Road, Daryaganj New Delhi – 110002.

10. B.P. Pandey – Modern Practical Botany Vol – I / II Chand & Company Ltd. Ramnagar New Delhi – 110055.

11. R.S. Shukla & P. S. Chandel. Plant Ecology. S. Chand & Company LTD. Ram Nagar, New Delhi.110055.

12. Pavas Divan – Environ Protection – Deep & Deep Publications D-I 124, RajouriGarden, New Delhi – 110027.

13. P.S. Verma / V.K. Agrawal – Concept of Ecology, S. Chand & Lonpan Ltd. Ramnagar, New Delhi – 110055.

14. Eug Warming – Ecology of Plants, Ambey Publications Delhi (India)

15. Evgene P Odum – Ecology Oxford & IBH Publishing Co. Pvt. Ltd. Culcutta, New Delhi.

16. Ishwar Prakash. Desert Ecology. Scientific Publications, Ratandas Road,Jodhpur.-342001-India.

17. T.W. Woodhead. Plant Ecology. SonaliPublications.New Delhi.110002.

18. Eug. Warming. Ecology of Plant. Ambey Publications Delhi.

19. Jonathan Silvertown. Introduction To Population Plant Ecology. Longman Singapure .Publisher, LTD.

# Paper- IV: Taxonomy of Angiosperms

## Taxonomy of Angiosperms (Lecture 35)

| | | | |
|---|---|---|---|
| **Unit 1:** | **1.1.** | Introduction | **(4 Lectures)** |
| | **1.2.** | Aims and Principles of Taxonomy | |
| **Unit 2:** | | **Classification** | **(8 Lectures)** |
| | **2.1.** | Types of classification:<br>Artificial, Natural and Phyllogenetic. | |
| | **2.2** | Bentham and Hooker system of classification | |
| | **2.3** | Merits and demerits | |
| **Unit 3:** | | **Identification and nomenclature** | **(8 Lectures)** |
| | **3.1** | Identification of plants | |
| | **3.2** | Nomenclature, Binomial nomenclature of plants | |
| | **3.3** | Principles of ICBN. | |
| **Unit 4:** | | **Herbarium and Botanical Garden** | **(5 Lectures)** |
| | **4.1** | Herbarium- Steps in preparation and significance. | |
| | **4.2** | Botanical gardens of India- Sir J. C. Bose Botanical Garden, Calcutta & Lead Botanical Garden of Shivaji University Kolhapur. | |
| **Unit 5:** | | **Study of Angiosperms families** | **(10** |
| | **5.1** | Systematic position, Morphologycal & distinguishing characters with economic importance of following families:<br>a) Caesalpiniaceae b) Solanaceae<br>c) Nyctaginaceae d) Liliaceae | **Lectures)** |

**Refrences:**


1. Morphology of Angiosperms, J M Coulter and C J Chamberlain, Pointer Publishers, Jaipur.
2. Taxonomy of Angiosperm R Pandey, S Chand and Co. Ltd, Ramnagar New Delhi.110055
3. An Introduction to Taxonomy of Angiosperms- Pritish Shukla, Shital P Mishra, Vikas Publishing House, Pvt. Ltd. Gaziabad, UP.
4. A Text Book of Angiosperms-B P Pandey, S Chand and Co Ltd. Ramnagar, New Delhi.110055
5. A Text Book of Botany -'Angiosperm,V Singh C Pande, D K Jain, Rastogi Publication, Shivaji Road Meerut.250002
6. Taxonomy of Angiosperm, Neeru Mathur, Sonali Publications, New Delhi, 110002.
7. Angiosperms-G L Chopra, Pradeep Publications, Jalandhar, 144008.
8. Simpson, M.G. (2006). *Plant Systematics*. Elsevier Academic Press, San Diego, CA, U.S.A.
9. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
10. Jeffrey, C. (1982). An introduction to plant Taxonomy, Cambridge University Press, Cambridge.
11. Judd, W.S., Campbell, C.S., Kellog, E.A., Steven, P.F. (2002). Plant Systematics-A Phyllogenetic approach. Sinauer Associates Inc., U.S.A. 2nd edition.

12. Maheshwari j.k. (1963). Flora of Delhi. CSIR, New Delhi.
13. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
14. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.
15. Gaikwad, S. P. & Garad, K. U. (2015). *Flora of Solapur District*, Laxmi Book Publication Solapur.

## List of Practicals (based on paper no I to IV):

1. Study of dissecting and compound microscope.
2. Electron micrographs/Models of viruses - T-Phage and TMV (photographs/models).
3. Gram staining (demonstration) and forms of Bacteria (permanent slides/photographs).
4. Identification of Algae (*Volvox, Sargassum, Gracillaria,*)
5. Study of *Nostoc.*
6. Study of *Spirogyra.*
7. Identification of Fungi (*Albugo, Penicilium, Agaricus,*)
8. Study of *Mucor.*
9. Study of Yeast
10. Identification of Archegoniates (*Marchantia, Adantium, Pinus*)
11. Study of *Riccia.*
12. Study of *Selaginella*- Morphology of sporophyte and anatomy of stem, Strobilus.
13. Study of *Cycas*- Morphology of sporophyte and anatomy of leaflet.
14. Study of *Cycas*- Reproductive structure: male cone, microsporophyll, microspore and megasporophyll, L. S. of ovule (permanent slide).
15. - 18. Study of plant families:
    a) Caesalpiniaceae
    b) Solanaceae.
    c) Nyctaginaceae
    d) Liliaceae
19. Study of soil $P^H$ by Universal indicator/pH paper/pH meter.
20. Study of Water holding capacity of different soil.
21. Study of meteorological instruments (any three).
22. Determination of Density and Frequency of plants by quadrat method.
23. Ecological adaptations of Hydrophytes (*Hydrilla*, *Eichhornia* and *Typha*).
24. Ecological adaptations of Xerophytes (*Nerium* and *Aloe*).
25. Excursion report.

# PUNYASHLOK AHILYADEVI HOLKAR

## SOLAPUR UNIVERSITY, SOLAPUR

Practicals of B.Sc. Part– I Botany (Semester System) (With effect from June 2019) Botanical Excursion: One teacher along with a batch not more than 20 students be taken for Botanical Excursion to places of Botanical interest, one in each term. If there are female students in a batch of twenty students, one additional lady teacher is permissible for excursion. T.A. and D.A. for teacher and non-teaching staff participating in excursions should be paid as per University rules. Tour report duly certified by teacher concerned and Head of the Department should be submitted at the time of practical examination. Practical Course: B.Sc. Part – I Botany practical course is to be covered in twenty five practicals. These practicals are to be performed by the students. Each practical is to be supplemented by permanent slides, preserved / fresh specimens, materials, charts, herbarium sheets, meteorological instruments where ever necessary.

**Details of Practical Examination:**

A) Every candidate must produce a certificate from Head of Department of his / her college, saying that he / she has completed practical course in satisfactory manner as per terms laid down by Academic council on the recommendations of Board of Studies in Botany. The student should record his / her observation and report of each experiment in the journal. The journal is to be signed periodically by teacher Incharge and certified by the Head of Department at the end of year. Candidates have to produce their certified journal and tour report at the time of practical examination. Candidate is not allowed to appear for the practical examination without a certified journal / loss certificate from Head of Botany Department regarding the same.

B) Practical Examination should be of five hours duration and shall test a candidate in the following respect. 1. Practical study of external and internal structures of different plant types and their classification. 2. Making temporary stained preparations and identification. 3. Identification and setting of biochemical experiments. 4. Study of plant families as per syllabus. 5. Spotting of the specimens as per syllabus.

**1. Structure of the courses:-**

A) Each paper of every subject for Arts, Social Sciences & Commerce Faculty shall be of 50 marks as resolved by the respective faculties and Academic Council.

B) For Science Faculty subjects each paper shall be of 100 marks and practical for every subject shall be of 100 Marks as resolved in the faculty and Academic Council.

C) For B. Pharmacy also the paper shall be of 50 marks for University examination. Internal marks will be given in the form of grades.

D) For courses which were in semester pattern will have their original distribution already of marks for each paper.

E) For the faculties of Education, Law, Engineering the course structure shall be as per the resolutions of the respective faculties and Academic Council.

2. Practical Examination for B. Sc. I. will be conducted at the end of second semester.

3. Examination fees for semester Examination will be decided in the Board of Examinations. The structures of all courses in all Faculties were approved and placed before the Academic Council. After considered deliberations and discussion it was decided not to convene a meeting of the Academic Council for the same matter as there is no deviation from any decision taken by Faculties and Academic Council. Nature of Question Paper approved by Hon. Vice Chancellor on behalf of the Academic Council.

# PUNYASHLOK AHALYADEVI HOLKAR
# SOLAPUR UNIVERSITY, SOLAPUR

**B.Sc. Part- I: Practical Examination in Botany**

**March/April 2020**

**Centre: ……...** **Batch: ……...**

**Date: ……...** **Total Marks -80**

**N. B.** *1. Draw neat and labeled diagrams wherever necessary.*
*2. Do not write about points of theoretical information unless asked specifically.*
*3. Perform the experiment as per instructions given by the examiners.*

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**Q. 1.** Identify and show the important structures observed by you in the given specimen- A, B and C. leave your preparation for inspection. **(No written answer)** **24**

**Q. 2.** Determine Density/Frequency of plants of given quadrat. **08**

**Q. 3.** Set up the ecological experiment- D assigned to you and shows it to the examiner **(No Written answer).** **08**

**OR**

Show the ecological adaptation in the given specimen- E **(No written answer).**

**Q. 4.** Assign the specimen- 'F' to its respective family on the basis of characters observed by you in it. Give important vegetative and floral characters. Draw the floral diagram/floral formula of it. **10**

**Q. 5.** **Identifications** **10**

a. Identify and describe the slide/photograph- **G** *(Viruses/ Gram staining/ Types of bacteria).*

b. Identify and describe- **H** *(Algae/Fungi).*

c. Identify and describe- **I** *(Bryophyte/Pteridophyte/Gymnosperm).*

d. Identify and describe- **J** *(Vegetative character/Reproductive character).*

e. Identify and describe the specimen- **K** *(Meteorological instrument).*

**Q. 6.** a. Journal **10**

b. Excursion report. **10**

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Humanities

## CHOICE BASED CREDIT SYSTEM

## Syllabus: English (Compulsory)

## Name of the Course: B.Sc. I ( Sem–I & II )

**(Syllabus to be implemented from w.e.f. June 2019)**

**B. A./B.Sc/B.Com–I**

**(Semester I and II)**

**ENGLISH (Compulsory) Revised Syllabus (CBCS)**

**(Introduced from June 2017)**

## Golden Petals (2019-2020)

**Prose:**

1. Charlie Chaplin – McDonald Conway and Ricci
2. The First Woman Jawan – Shanti Tigga
3. Nachiketa – Adapted from the Original Story

**Poetry:**

1. I Find No Peace – Thomas Wyatt
2. Success is Counted Sweetest – Emily Dickenson

**Grammar and Vocabulory:**

**Unit 1**

Parts of Speech

1. Nouns
2. Pronouns
3. Articles
4. Verbs

**Communication**

1. What is Communication?
2. Words and Thoughts
3. Process of Communication: The Communication Cycle, the Sender of the Message, Channel, Feedback
4. Communication Environment, Essentials of Effective Communication

# Semester II

**Prose:**

4. Letter to a Teacher – The School of Barbiana
5. My Duty to My Neighbour – Sir Earnest Barker
6. The End of the Mohan Man-Eater – Jim Corbett

**Poetry:**

3. Indian Weavers – Sarojini Naidu
4. When I Think of Death – Maya Angelou

**Grammar and Vocabulary:**

2. Tenses

**Communication:**

**Unit 2**

1. Interviewing
2. Group Discussion
3. Email
4. Blog and Social Media

## Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**B. A./B.Sc/B.Com–I**

**(Semester I and II)**

**ENGLISH (Compulsory) Revised Syllabus (CBCS)**

**Golden Petals (2019-2020)**

## Total Theory Lectures 45

## Semester I

**Unit 1** **Credit 01** **No. of Lectures 15**

**Prose:**

4. Charlie Chaplin – McDonald Conway and Ricci
5. The First Woman Jawan – Shanti Tigga
6. Nachiketa – Adapted from the Original Story

**Unit 2** **Credit 01** **No. of Lectures 15**

**Poetry, Grammar and Vocabulary**

5. I Find No Peace – Thomas Wyatt
6. Success is Counted Sweetest – Emily Dickenson

**Grammar and Vocabulary**

**Parts of Speech**

5. Nouns
6. Pronouns
7. Articles
8. Verbs

**Unit 3** **Credit 01** **No. of Lectures 15**

**Communication**

5. What is Communication?
6. Words and Thoughts
7. Process of Communication: The Communication Cycle, the Sender of the Message, Channel, Feedback
8. Communication Environment, Essentials of Effective Communication

# Golden Petals

## Total Theory Lectures 45

## Semester II

**Unit 1** **Credit 01** **No. of Lectures 15**

**Prose:**

4. Letter to a Teacher – The School of Barbiana
5. My Duty to My Neighbour – Sir Earnest Barker
6. The End of the Mohan Man-Eater – Jim Corbett

**Unit 2** **Credit 01** **No. of Lectures 15**

**Poetry and Grammar**

**Poetry:**

7. Indian Weavers – Sarojini Naidu
8. When I Think of Death – Maya Angelou

**Grammar:**

2. Tenses

**Unit 3** **Credit 01** **No. of Lectures 15**

**Communication:**

Unit 2

5. Interviewing
6. Group Discussion
7. Email
8. Blog and Social Media

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR


**Name of the Faculty: Faculty of Humanities**

**Syllabus, Name of the Course: B.A., B.Com. and B. Sc. Part I**

## Compulsory English

**With effect from June 2020-21, 21-22, 22-23**

**Preamble :**

English is the secondary language introduced as the compulsory subject at B.A., B.com and B. Sc. Part I. The text prescribed for the syllabus is divided into four sections. It includes prose, poetry, grammar and communication skills. The prose and poetry section aim to strengthen students' reading as well as comprehension skills and give them an opportunity to develop literary sensibility and taste. The section on grammar and vocabulary provides brief, useful guidelines on the form and the function of language. The section on communication skills includes topics on useful oral and written communication necessary in the present global scenario.

1) **Objectives of the Course:**

- To introduce to the students various forms of communication.
- To make the teaching of English more practical and student centric.
- To introduce to the students poems from across the globe.
- To acquaint the students with different forms of prose.
- To acquaint the students with different language skills.

2) **Outcome** : At the end of the course students will

- Understand the concepts of communication.
- Expand their vocabulary after reading the prescribed texts.
- Attain writing, speaking, reading, & listening competence.
- Be aware of the correct usage of English grammar
- Become familiar with selected literary forms, develop and strengthen their imaginative ability and the ability to analyze different literary forms.

**Title of the Course/Paper**

**(Compulsory English)**

**Semester I and II**

**[Credits: 4 ]**

**Unit no: 1** Prose(Credit 01)**(15)**

**Unit no: 2** Poetry

**Unit no: 3** Grammar (Credit for Unit 2 and 3: 01) **(15)**

**Unit no. 4** Communication Skills (Credit for Unit 4: 02) **(30)**

**List of Reference Books:**

1. Prescribed Text Book
2. **"A Student's Introduction to English Grammar" by Rodney Huddleston and Geoffrey K. Pullum. 2002.**

**Equivalent Subject for Old Syllabus**

| Sr. No. | Name of the Old Paper | Name of the New Paper |
|---|---|---|
| 1) | Compulsory English | Compulsory English |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern (for B.A., B. Com. and B.Sc. I)

**B. A. –I (Semester I and II)**

**ENGLISH (Compulsory) Revised Syllabus (CBCS)**

**(Introduced from June 2020)**

**Que.1 Rewrite the following by choosing the correct alternative. (08)**

**(Poems, Prose and Grammar)**

**Que.2 Write the answers in short. (Any Four out Six) (12)**

**( Prose and Poetry )**

**Que.3 Broad question (any one) (10)**

**(Communication Skills)**

**Que. 4 Broad question General topics (10)**

**(Communication Skills)**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**B. A. –I**
**(Semester I and II)**
**ENGLISH (OPTIONAL)**
**Revised Syllabus (CBCS)**
**(Introduced from June 2020)**
**INTRODUCTION TO ENGLISH LITERATURE**
**PAPER NO. I**
**(2020-2021)**

**Preamble:** Introduction to English Literature and Language paper is introduced to B.A. –I (Optional) students for the 1st and 2nd semester with the aim to introduce students to various literary forms in English literature and language. The Poems and Short Stories, One Act Plays and Literary Terms prescribed for the syllabus will help them to develop interest in reading English literature written worldwide.

**2) Objectives of the Course:**

- To acquaint students with literary forms and literary terms.
- To initiate students and provide them a firsthand experience of reading and interpreting literary texts.
- To acquaint students with structural and analytical techniques in poetry.
- To acquaint students with analysis of minor literary form i.e. short stories and one act plays.

3) **Outcome :** At the end of the course students will be

- Familiar with the various forms of the literature
- Able to analyze the forms of literature
- Able to interpret the text

**Semester: I**

**Introduction to English Literature (Poems and Short stories)**

**General Topic:**

- Elements of Short Story.
- Forms of Poetry.

**Poems:**

| | |
|---|---|
| 1) Robert Frost - | Mending Wall |
| 2) Maya Angelou | Caged Bird |
| 3) Rabindranath Tagore | Where the Mind is Without Fear |
| 4) Elizabeth Barrett Browning | How Do I Love Thee? (Sonnet 43) |
| 5) Percy Bysshe Shelley | Ozymandias |

**Short Stories:**

1) Arthur Conan Doyle - The Crooked Man
2) Anton Chekhov: The Beggar
3) Leo Tolstoy The Three Questions
4) R. K. Narayan Engine Trouble

**Semester: II**

**Introduction to English Literature**

**(One Act Plays and Literary Terms)**

**1. General Topics:**

**• The Elements of One Act Play.**

**2. One Act Play:**

a. A Marriage Proposal – Anton Chekov
b. The Boy Comes Home – A. A. Milne
c. The Monkey's Paw – W. M. Jacobs
d. The Man with a Flower in His Mouth – Luigi Pirandello

**3. Literary Terms:**

a. Simile
b. Metaphor
c. Imagery
d. Personification
e. Contrast
f. Allegory
g. Narrative Technique
h. Symbolism
i. Soliloquy
j. Monologue
k. Setting

**Reference Books:**

1. Masks- One Act Plays by D. S. Maini.
2. Glossary of Literary Terms by M. H. Abrahms

**Introduction to English Literature**
**Total Theory Lectures 60**

**Semester I**

**Unit 1** **Credit 01** **No. of Lectures 15**
**General Topics:**

**Unit 2**
**Credit 1.5** **No. of Lectures** 22
**Poems:**

| | |
|---|---|
| 1) Robert Frost - | Mending Wall |
| 2) Maya Angelou | Caged Bird |
| 3) Rabindranath Tagore | Where the mind is Without Fear? |
| 4) Elizabeth Barrett Browning | How Do I Love Thee? (Sonnet 43) |
| 5) Percy Bysshe Shelley | Ozymandias |

**Unit 3** **Credit 1.5** **No. of Lectures 23**

**Short Stories:**

| | |
|---|---|
| 1) Arthur Conan Doyle - | The Crooked Man |
| 2) Anton Chekhov: | The Beggar |
| 3) Leo Tolstoy | The Three Questions |
| 4) R. K. Narayan | Engine Trouble |

**Semester: II**
**Introduction to English Literature**
**(One Act Plays and Literary Terms)**

**Unit 1** **Credit 01** **No. of Lectures 15**

**One Act Play:**

a. A Marriage Proposal – Anton Chekov

b. The Boy Comes Home – A. A. Milne

c. The Monkey's Paw – W. M. Jacobs

d. The Man with a Flower in His Mouth – Luigi Pirandello

**Unit 2** **Credit 1.5** **No. of Lectures 22**

**General Topic:**

• Define One Act Play and discuss the elements of the One Act Play.

**Unit 3** **Credit 1.5** **No. of Lectures 23**

**Literary Terms:**

a. Simile

b. Metaphor

c. Imagery

d. Personification

e. Contrast

f. Allegory

g. Narrative Technique

h. Symbolism

i. Soliloquy

j. Monologue

k. Aside

l. Setting

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester I and II)**

**ENGLISH (OPTIONAL) Revised Syllabus (CBCS)**

**(Introduced from June 2020)**

**Que.1 Rewrite the following by choosing the correct alternative. (08)**

**Sem I (Poems, Short stories) Sem II ( One act plays)**

**Que.2 Write the answers in short. (Any Four out Six) (12)**

**SemI (Poems) Sem – II ( literary terms)**

**Que.3 Broad question (any one) (10)**

**Sem (Short Stories) Sem II ( One Act Plays)**

**Que. 4 Broad question on General topic (10)**

**B.A.(Part-I) LINGUISTICS (Optional)**

**Title: - Introduction to Linguistics (Semester I & II)**

(With effect from 2020-2021)

**Preamble :** The paper 'Introduction to Linguistics' is introduced at BA (Part I ) for semester I & II as an optional paper of Linguistics with an aim to introduce students with the basic knowledge of Linguistics and more specifically it is an introduction of 'Linguistics' as an independent subject. The components in the syllabus will cope with the present need of the students in the socio-educational scenario.

**Course Objectives:**

- To introduce Linguistics as a discipline of knowledge.
- To familiarize students with basics of linguistics and the key concepts.
- To make students aware of the nuances of English Language
- To enable students to use English language with proper pronunciation
- To equip students with good communication skills in English

**Course Outcome:**

At the end of the course, the students will be able to-

- Define Linguistics as a separate discipline
- Explain the basic concepts in Linguistics
- Use English with proper pronunciation as per RP
- Communicate efficiently in English

**Semester-I (Paper No. I) (Lectures - 60)**

**Title of the Paper: Introduction to Linguistics**

## Unit I - Language and Linguistics (30 Lectures)

1.1 Language and its definitions

1.2 Characteristics of human language

1.3 Animal communication system and human language

1.4 What is Linguistics: synchronic and diachronic approaches

1.5 Introduction to branches of linguistics: Phonetics, Phonology, Morphology, Syntax, Semantics and Pragmatics

## Unit II - Phonetics and Phonology (30 Lectures)

2.1 Phonetics and Phonology

2.2 Articulatory Phonetics

2.3 Initiation, Phonation and articulation

2.4 Description of speech sounds of English: Consonants and Vowels

2.5 Transcription (Phonemic) of words with stress, minimal pairs, CV structure of syllables

**Semester-II (Paper No. II) (Lectures - 60)**

**Title of the Paper: Introduction to Linguistics**

## Unit III- Linguistics of words (45 Lectures)

3.1 Morphological Approach:

- 3.1.1 What is Morphology?
- 3.1.2 Morpheme and its types, Allomorphs
- 3.1.3 Word formation Processes: Major and Minor.
- 3.1.4 Morphological Analysis of Words (labeled tree diagram)

3.2 Semantic Approach:

- 3.2.1 What is Semantics?
- 3.2.2 Lexical relation: synonyms and antonyms

3.3 Syntactic Approach:

- 3.3.1 What is Syntax?
- 3.3.2 Words: Open class words and closed class words

## Unit IV - The Basic Skills of Language Learning (15 Lectures)

4.1 Listening Skill, Speaking Skill, Reading Skill and Writing Skill

4.2 Types and Ways to Improve L/S/R/W

## Books Recommended


- Bikram K. Das (Orient Longman)*Functional Grammar and Spoken and Written Communication in English*
- V. R. Narayana Swami (Orient Longman)*Strengthen your writing*
- Patil, Valke, Thorat and Merchant. (Macmillan)*English for Practical Purposes*
- ArunaKoneru*English Language Skills*
- Verma and Krishnaswamy; *Modern Linguistics; An Introduction*
- Crystal, David: *A Course in Modern Linguistics.*
- Balasubramanian, T:*A Textbook of English Phonetics for Indian Students*
- Bansal and Harrison *: Spoken English for India*
- Quirk, R. and S. Greenbaum: *A University Grammar of English*
- Lyons, John: *Language and Linguistics*
- Palmer: *Semantics*
- Jones, Daniel: *English Pronouncing Dictionary*
- Leech Geoffrey: *English Grammar for Today.*

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester I ) Paper I**

**(Introduced from June 2020)**

**(Linguistics (Optional )**

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| | | |
|---|---|---|
| **Q1** | **Multiple type questions to be set on the syllabus topic2** | |
| | **(Unit 2 Phonetics and Phonology)** | **Marks 8** |
| **Q2** | **Short answer type questions (practical type questions) to be set on the syllabus topic2** | |
| | **(Unit 2 Phonetics and Phonology)(4out of6)** | **Marks12** |
| **Q3 A** | **Broad answer type question with an internal option (A or B) to be set on the syllabus topic 1** | |
| | **(Unit 1 Language and Linguistics)** | **Marks 10** |
| **Q4** | **A broad question on the syllabus topic 1** | |
| | **(Unit1 Language and Linguistics)** | **Marks 10** |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester II) Paper II**

**(Introduced from June 2020)**

**(Linguistics (Optional)**

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**Q1 Multiple Choice type questions to be set on the syllabus topic3**

**(Unit 3 Linguistics of Words) Marks 8**

**Q2 Short answer type questions (practical type questions) to be set on the syllabus topic3**

**(Unit 3 Linguistics of Words) (4out of 6) Marks12**

**Q3 A broad answer type question with an internal option (A or B) to be set on the syllabus topic 3**

**(Unit 3 Linguistics of Words) Marks 10**

**Q4 A Broad question on the syllabus topic 4**

**(Unit4 Basic Skills of Language Learning) Marks 10**

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# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: BOTANY

## Name of the Course: B.Sc. II (Sem.–III& IV)

**(Syllabus to be implemented from w.e.f. June 2020)**

# Draft Structure for B. Sc-II

## Core Subject: Botany

**PUNYASHLOK AHILYADEVI HOLKAR**

**Solapur University, Solapur**

**Faculty of Science & Technology**

**Choice Based Credit System (CBCS) (w.e.f.2020-21)**

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| Class : | B.Sc.- II Semester – III | | | | | | | | | |
| Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR | | DSC 1C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3C | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | AECC - Environmental Studies | | 3.0 | -- | -- | - | - | - | NC |
| | | SEC-1 | | 2.5 | | | 50 | 40 | 10 | 2.0 |
| Grand Total | | | | 23.5 | -- | -- | 350 | 280 | 70 | 14 |
| Class : | B.Sc.- II Semester – IV | | | | | | | | | |
| Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject OR Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe | | DSC 1D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 2D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | DSC 3D | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Elective Subject | | | | | | | | | |
| | SEC-2 | | 2.5 | | | 50 | 40 | 10 | 2.0 |
| Total (Theory) | | | 20.5 | -- | -- | 350 | 280 | 70 | 14 |
| DSE (Practical ) | DSC 1C & 1D | Pr. III&IV | -- | -- | 8 | 50 | 40 | 10 | 4.0 |
| | DSC 2C & 2D | Pr. III&IV | -- | -- | 8 | 50 | 40 | 10 | 4.0 |
| | DSC 3C & 3D | Pr. III&IV | -- | -- | 8 | 50 | 40 | 10 | 4.0 |
| Total (Practical) | | | | | 24 | 300 | 240 | 60 | 12 |
| Grand Total | | | 43.5 | | 24 | 1000 | 800 | 200 | 40 |

Abbreviations:

L: Lectures

T: Tutorials

P: Practicals

UA: University Assessment

CA: College Assessment

DSC / CC: Core Course

AEC: Ability Enhancement Course

DSE: Discipline Specific Elective Paper

SEC: Skill Enhancement Course

GE: Generic Elective

CA: Continuous Assessment

ESE: End Semester Examination

# B.Sc.II SYLLABUS WITH EFFECT FROM JUNE 2020

**SEMESTER- III**

## Paper V
## Plant Anatomy **35Lectures**

**Unit 1: Meristematic tissue (8 Lectures)**

Introduction, Characteristics and Classification of meristems based on position
Classification of meristem based on origin, position and plain of division.
Theories of structural development
a)Apical cell theory
b) Histogen theory
c) Tunica Corpus theory.

**Unit 2. Permanent tissue: (08Lectures)**

Simpleand complex tissue
structure and function of simple tissues
a)Parenchyma . b) Collenchyma c) Sclerenchyma
structure and function of Complex tissue
a) Xylem b) Phloem
Types of Vascular bundles

**Unit 3. Primary structure of plant body. (06Lectures)**

Primary structure of Monocotyledon and Dicotyledon root.
Primary structure of Monocotyledon and Dicotyledon stem.

**Unit 04 . . Secondary structure of plant body. (08Lectures)**

Normal secondary growth in Dicotyledon root and stem
Anamalous l secondary growth in Bignonia (Dicot.) and Dracaena stem.
4.1Vascular cambium – structure and function
4.4 Periderm and Lenticel,Tylosis, Wood types.

**Unit 5: Tissue system . (05Lectures)**

5.1 : Epidermal tissue system

5.2: Secretary tissue system

5.3:Mechanical tissue system

# Paper VI

## Plant metabolism **35 Lectures**

**Unit 1: Enzymes** **(8 Lectures)**

Introduction.
Classification of enzymes.
mechanism of enzyme action.
Properties of enzymes.

**Unit 2: Nitrogen metabolism** **(5 Lectures)**

Introduction,
Nitrogen cycle
Biological nitrogen fixation – Definition, types and organisms involved,
Mechanism of biological nitrogen fixation.
Significance of biological nitrogen fixation

**Unit 3: Plant growth regulators** **(8 Lectures)**

Introduction
Discovery
Types of growth regulators
a. PGR - auxins, gibberellins, cytokinins (Physiological role of growth regulators)
b. Growth inhibitors – ABA, Ethylene (Physiological role of growth regulators)

**U nit 4: Mineral nutrition** **(6 Lectures)**

Introduction,
Macronutrients, Role of macronutrients (N, P, K), Role of Micronutrients (Fe, Mn.)

**Unit 5: Carbohydrate metabolism** **(8 Lectures)**

Introduction and
Broad classification;
Monosaccharides - Properties and examples (Triose , Tetrose, Pentose and Hexose)
oligosaccharides - Properties and examples (Sucrose , Maltose and Lactose)
Polysaccharides - Properties and examples (Starch and Cellulose)

**SEMESTER IV**

# Paper VII

## Plant Physiology **35 Lectures**

**Unit 1: Plant response to light and temperature (8 Lectures)**

Photoperiodism – Definition, Classification (SDP, LDP, Day neutral plants);
Phytochrome Definition, Role of phytochrome (red and far red light responses on photo morphogenesis);
Vernalization: Definition, Mechanism, Significance.

**Unit 2: Translocation in phloem (6 Lectures)**

Definition of Symplastic transport and apoplastic transport,
Phloem loading and unloading.
Mechanism of translocation in phloem – Mass flow hypothesis
Source and sink relationship : During vegetative and reproductive phase.

**Unit 3: Photosynthesis (8 Lectures)**

Introduction.
Photosynthetic Apparatus
Photosynthetic Pigments (Chl a, b, xanthophylls, carotene);
Light reaction – Cyclic and non cyclic
Dark reaction – C3, C4, CAM Pathway

**U nit 4: Respiration (5 Lectures)**

Introduction
Structure of Mitochondrion
Types – Arobic - Glycolysis, Linkage stage and TCA Cycle
ETS

**Unit 5: photorespiration (8 Lectures)**

Introduction:
Site of photorespiration
Mechanism of photorespiration
Significance

# Paper VIII

**EMBRYOLOGY OF ANGIOSPERMS 35 Lectures**

**Unit 1: Structural organization of flower (9 Lectures)**

1.1. Concept of flower as a modified Shoot.
structure of typical flower.
Structure of typical Androceium, Structure of tetrasporangiate anther and pollen grain.
: Structure of typical Gynoecium: Structure of a typical ovule, Types of ovules.

**Unit 2.: Pollination and fertilization (9 Lectures)**

2.1 Definition, self and cross Pollination
2. 2 **M**echanism in Anemophily (*Zea mays*), Entomophily (*Calotropis*) and Hydrophily (*Vallisneria*)
:Microsporogensis, and development off male gametophyte
:Megasporogenesis and development of female gametophyte: Monosporic (*Polygonum*) and Bisporic (*Allium*)
2.4 **Fertilization**: Entry of pollen tube, double fertilization and triple fusion. Significance of double fertilization.

**Unit 3: Embryo and Endosperm Development. (9 Lectures)**

3.1Structure and development of embryo in Monocotyledons.
3.2Structure and development of embryo in Dicotyledons.
Development of endosperm,.
Types of endosperm- Nuclear, Helobial and Cellular.

**Unit 4. : Seed and fruit dispersal (8 Lectures)**

Agents and mechanism of seed and fruit dispersal.

**Practical- I**

1) Study of shoot and root apex by permanent slides.
2) Study of simple tissues.
3) Study of complex tissues.
4) Study of primary structure of dicot and monocot root
5) Study of primary structure of dicot and monocot stem
6) Study of anomalous secondary growth in *Bignonia*.
7) Study of anomalous secondary growth in *Dracaena*.
8) Study of double stained micro preparation in Bignonia *and Dracaena* stem.
9) Study of double stained preparation of anomalous secondary growth in *Dracaena*.
10) Study of anatomy of porous (ring porous & diffused porous) and non porous wood.
11) Maceration technique.
12) Study of Epidermal tissue system.
13) Study of Secretary Tissue system.
14) Study of Mechanical tissue system.
15) Study of role and deficiency symptoms of N, P, K,
16) Study of role and deficiency symptoms of Fe, Mn.
17) Estimation of Chlorophylls by Colourometric / Spectrophotometric method.
18) Separation of photosynthetic pigments by ascending paper chromatography.
19) Study of Kranz leaf anatomy in C4 plants.
20) Estimation of TAN value in CAM plants.
21) Study of evolution of oxygen during photosynthesis.
22) Study of effect of light intensity on photosynthesis.
23) Detection of Phosphate, Potassium and Iron in the plant tissue by biochemical tests.
24) Determination of sugar percentage by hand refractometer.
25) Botanical Excursion Report.

**Practical- II**

1) Study of typical flower and its parts (floral whorls with their functions).
2) Study of young / mature anther by permanent slide.
3) Study of germination of pollen grains.
4) Detection of pollen fertility by staining technique.
5) Study of types of ovules (by permanent slide or photograph).
6) Study of dicotyledon and monocotyledon embryo (by permanent slide or photograph).
7) Dissection of embryo
8) Study of endosperm from developing seeds (Grevellia /Cucumis).
9) Dispersal of seeds.
10) Dispersal of Fruits.
11) Study of self pollinated plants
12) Study of cross pollinated plants
13) Study of pollination mechanism (Maize, *Calotropis*)
14) Determination of rate of respiration during seed germination by Ganong's respirometer.
15) Effect of different concentrations of Auxins (IAA) on seed germination (any suitable dicot seeds).
16) Effect of different concentrations of Gibberellic acid (GA) on seed germination (any suitable monocot seeds).
17) Effect of different concentrations of Ethylene on fruit ripening
18) Breaking of seed dormancy by mechanical and chemical scarification.
19) Study of effect of pH on Catalase enzyme activity.
20) Study of effect of temperature on Malate dehydrogenase enzyme activity.
21) Janus green B staining technique for mitochondria.
22) Demonstration of fermentation.
23) Study of biofertilizers.
24) Separation of Amino acids by Thin Layer chromatography.
25) Horticulture Term Paper / Field Visit Report / Project Report

**Plant Physiology and Metabolism**


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27. S. Sundara rajan- Plants Physiology. Anmol Publications, Pvt. LTD.New Delhi.110002.

# Angiosperm Anatomy and Embryology


1. P.C. Vashista. - Plant Anatomy. Pradip Publications, Opposite Sitla mandir, Jalandhar- 144008.
2. B.P.Pandey - Plant Anatomy. S.Chand & Company,LTD. Ram Nagar, New Delhi.110055.
3. A.C.Datta. - Botany For Degree Students. Press-Delhi, Bombay, Madrass
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25. S. C. Datta. Systematic Botany. New Age International Publishers, New Delhi. (2015).

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**B.Sc. II Practical Examination in Botany (CBCS)**

**March/April 2020**

**Center:** **Practical II**

**Date:** **Batch** **Total Marks: 40**

**N.B.-**

**1. Draw neat & labeled diagrams wherever necessary**

**2. Do not write about points of theoretical information unless asked specifically**

**3. Perform the experiment as per instructions given by the examiner**

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Make a double stain permeant micro preparation of a T.S. of specimen A and show it to the examiner (No written answer) 07

Macerate the given sample B & prepare a slide from it. Show the slide to the examiner (No written answer) 04

Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 07

Set up the physiological experiment assigned to you and record your observations, submit the report to the examiner (written answer) 04

Q.5. Identification 08

E- Identify & Describe

F- Identify & Describe

G-Identify the role & deficiency symptoms

H-Identify the role & Deficiency symptoms

I- Identify & describe the biochemical test

Q.6. A) Journal 05

B) Excursion Report 05

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**
**B.Sc. II Practical Examination IN Botany (CBCS)**
**Practical -III**
**March/April 2020**

**Center:**

**Date:** **Total Marks: 40**

**N.B.-**

**1. Draw neat & labelled diagrams wherever necessary**

**2. Do not write about points of theoretical information unless asked specifically**

**3. Perform the experiment as per instructions given by the examiner**

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Q.1.Determine the fertility of pollen / Perform practical for detection of pollen germination of given specimen A (Written answer) 04

Q.2.Dissect out the given material B for embryo dissection/describe the dicot or monocot embryo by using permanent slides/photographs(No written answer) 03

Q.3.Identify the mechanism of pollination of given material C (written answer) 03

Q.4.Perform the practical to detect rate of respiration/Separate the given sample D by TLC to detect amino acids. (Written answer) 06

Q.5.Detect the enzyme activity of given sample E/Detect the mitochondria in given sample E by using specific staining method. (Written answer) 04

Identification 10

F- Identify & Describe

G- Identify & Describe

H-Identify & describe mode of seed dispersal

I-Identify & describe effect of growth regulators

J- Identify& comment on

Q.6. A) Journal 05

B) Horticulture term paper 05

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

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सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

# Syllabus: Chemistry

## Name of the Course: B.Sc. II (Sem–III & IV)

**(Syllabus to be implemented from w.e.f. June 2020-21)**

**Course outcomes:**

**Student should learn**

1. **Basics of the chemistry along with the practical applications/skills, industrial usage**
2. **The principles underlying the different experiments**
3. **Functional group conversions**
4. **Preparation of standard solutions and analytical skills**
5. **Handling of instruments to develop instrumental skills with respect to industries**
6. **Nomenclature of inorganic and organic compounds and their characterization**

# P. A. H. Solapur University, Solapur

## B.Sc. Part-II Chemistry

## Choice Based Credit System (CBCS)

### In force from June-2020

**General Structure :**

There will be two theory papers of 50 marks (UA 40 + CA 10 marks) for each semester. There titles & marks distribution are as under.

**N. B.**

i. Figures shown in bracket indicates the total number of contact hours required for the respective topics

ii. The question paper should cover the entire syllabus. Marks should be in proportion with the number of contact hours allotted to respective topics.

iii. All topics should be dealt with S.I units.

iv. Use of scientific calculator is allowed.

v. Industrial tour is prescribed.

**Semester-III**

Paper-V : Organic Chemistry 50 marks (40 + 10 marks)

Paper-VI : Inorganic Chemistry 50 marks (40 + 10 marks)

**Semester-IV**

Paper-VII : Physical Chemistry 50 marks (40 + 10 marks)

Paper-VIII : Analytical & Industrial Inorganic Chemistry 50 marks (40 + 10 marks)

**Practical Course : Practical Examination will be held at the end of the year - 100 marks = (UA 80 + CA 20)**

**A) Distribution of marks :**

a) Physical : 20 marks (15 marks physical experiment + 5 marks oral + Journal- 3 marks

b) Inorganic : 30 marks (gravimetric analysis-15 marks + Preparation- 10 marks /Volumetric estimation – 15 marks + Preparation- 10 marks/ semi-micro analysis 15 marks + Preparation- 10 marks +_5 marks oral + Journal- 4 marks

c) Organic : 20 marks (organic qualitative Analysis- 15 marks/ estimation- 15 marks/ preparation- 15 marks oral- 5 marks + Journal- 3 marks

**B) Duration of Examination –** Two days, 6 hrs. per day

## Equivalent Subject for Old Syllabus

| Sr. No. | Name of the Old Paper | Name of the New Paper |
|---|---|---|
| 1) | Paper: III Organic Chemistry | Paper: V Organic Chemistry |
| 2) | Paper: IV Inorganic Chemistry | Paper: VI Inorganic Chemistry |
| 3) | Paper: V Physical Chemistry | Paper: VII Physical Chemistry |
| 4) | Paper: VI Analytical and Industrial Inorganic Chemistry | Paper: VIII Analytical and Industrial Inorganic Chemistry |

# Semester-III
# Paper-V: Organic Chemistry

**Total Credits: 2**
**(45 Contact hrs.)**

**UNIT-I**

**1. Spectroscopic Methods** **(8)**

**Ultra-Violet (UV) absorption:**

Introduction to Spectroscopy, Beer – Lambert law ( mathematical derivation not expected), Types of electronic transitions, Terms used in UV spectroscopy: Chromophore, Auxochrome, Bathocromic Hypsochromic, Hypochromic and Hyperchromic shifts, Effect of conjugation on position of UV and visible bands. Calculation of max by Woodward-Fieser rules for conjugated dienes and enones. Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and trans) spectral problems based on UV. (Spectroscopic charts will not be supplied)

**2. Stereochemistry** **(8)**

**2.1. Geometrical isomerism:** Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes.

**2.2. Conformational Isomerism:** Introduction, conformation of ethane and n-butane and their representation by using Saw-Horse, Fischer (dotted Wedge line) and Newmann's projection formulae.

**2.3.** Conformational analysis of ethane and n-butane with the help of energy profile diagrams.

**2.4.** Nomenclature – D & L, R & S, E & Z systems

**3. Alcohols and Phenols** **(8)**

**3.1. Alcohols : Introduction**

i. Dihydric alcohols : Nomenclature, Methods of formation of ethylene glycol from ethylene, ethylene dibromide and ethylene oxide, physical properties & chemical reactions of ethylene glycol – acidic nature, reaction with hydrogen halide, oxidation – lead acetate, $HIO_4$ and nitric acid, Uses of ethylene glycol. Pinacol formation, Pinacol-Pinacolone rearrangement and its mechanism.

ii. Trihydric alcohols: Nomenclature, Methods of formation of glycerol – from fats and oils physical properties. Chemical reactions of glycerol – reaction with electropositive metals, reaction with hydrogen halide HCl and HI Reaction with conc. nitric acid in presence of conc. sulphuric acid. Reactions with potassium hydrogen sulphate, esterification, oxidation. Uses of glycerol.

**3.2. Phenols :** Introduction, Reactions of phenol (carbolic acid) :

i. Acylation and Fries rearrangement
ii. Ether formation and claisen rearrangement
iii. Gattermann Synthesis
iv. Carboxylation – Kolbe's reaction
v. Reimer – Tiemann reaction and its mechanism.

**UNIT- II**

**4. Aldehydes and Ketones** **(5)**

Introduction, Nomenclature, structure and reactivity of the carboxyl group. Mechanism of nucleophilic additions to carbonyl group. Study of following reactions with mechanism and applications 1) Aldol condensation (base catalysed), 2) Perkin reaction, 3) Cannizzaro's reaction, 4) Knoevenagel reaction 5) benzoin condensation..

**5. Ethers and Epoxides** **(5)**

**5.1. Ethers :** Introduction, Nomenclature, Methods of formation of anisole by Williamson's synthesis and from diazomethane, chemical reactions of anisole with HI, Gravimetric estimation of $-OCH_3$ group by Ziesel's method (Related problems are expected based on % of $-OCH_3$ and number of $-OCH_3$ groups).

**5.2. Epoxides :** Introduction, Nomenclature, commercial method of preparation of ethylene oxide. Acid and base catalysed ring opening of ethylene oxide, reactions of Grignard and organolithium reagents with ethylene oxide.

**6. Carboxylic acids** **(7)**

**6.1.** Monocarboxylic acids : Introduction. Methods of formation of Halo acids, di- and trichloroacetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles $CN^-$, $OH^-$, $I^-$, and $NH_3$.

**6.2.** Hydroxy acids : A. Malic acid and B. Citric acid, Methods of formation of malic acid from maleic acid and from α-bromo succinic acid. Reactions of malic acid – action of heat, oxidation reaction and reaction with HI, uses of malic acid. Methods of formation of citric acid from glycerol. Reactions of citric acid: Acetylation with acetic anhydride reduction by HI, Action of heat at $422^0$K. Uses of citric acid.

**6.3.** Unsaturated acids : Methods of formation A. Acrylic acid from acrolein and by dehydration of β-hydroxy propionic acid. Reactions of acrylic acid – Addition of $H_2O$, reduction by Na / $C_2H_5OH$. Uses of acrylic acid. Methods of formation B. Cinnamic acid from benzaldehyde using diethyl malonate and by using acetic anhydride and sodium acetate. Reactions of cinnamic acid – bromination, oxidation. Uses of cinnamic acid.

**6.4.** Dicarboxylic acids : Succinic and phthalic acids. Methods of formation of succinic acid from ethylene bromide, maleic acid. Reactions of succinic acid – action of heat, action of $NaHCO_3$, $C_2H_5OH$ in presence of acid. Uses of succinic acid. Methods of formation of phthalic acid from o-xylene and naphthalene Reactions of phthalic acid – action of heat, reaction with sodalime, $NH_3$. Uses of phthalic acid.

**7. Diazonium Salts** **(4)**

7.1 Diazonium salts : Introduction, benzene diazonium chloride – preaparation, chemical properties.

i. Formation of iodo benzene
ii. Sandmeyer's reaction
iii. Formation of benzene
iv. Formation of phenylhydrazine
v. Azo coupling – synthesis of methyl orange and congo red.

## Reference Books :

Latest editions of following reference books.


1. Organic Chemistry. Volume 1 – The fundamental principles by I.L. Finar.
2. Organic Chemistry. Volume 2 – Stereochemistry and the chemistry of natural. Products by I.L. Finar, Low-priced Edn. ELBS – Longman
3. Organic Chemistry. Volume I, II, III by S.M. Mukharjee, S.P. Singh and R.P. Kapoor. Wiley Eastern Limited.
4. Advanced Organic Chemistry by, B.S. Bahl, Arun Bahl. S.Chand & Company, Ltd.
5. Organic Chemistry by Morrison – Boyd.
6. A Text Book of Organic Chemistry by K.S. Tiwari. S.N. Meharotra. N.K. Vishnoi. Vikas Publication, Meerut.
7. Spectroscopic methods in Organic Chemistry by Williams and Fleming. Mc-Graw Hill.
8. Stereochemistry of Organic Compounds by E.L. Eliel. Orient Longman.
9. Stereochemistry of Organic Compounds by P.S. Kalsi. New Age International Ltd.
10. A Guide Book to Mechanism in Organic Chemistry by Peter Sykes.
11. Advanced Organic Chemistry, structure, reactions and mechanism by Jerry March. Mc Graw Hill Kogakusha, Ltd.
12. Spectroscopy of Organic Compounds by P.S. Kalsi.
13. Absorption spectroscopy of Organic molecules by V.M. Parikh.
14. College Organic Chemistry Part I & II by G.R. Chatwal.
15. Stereochemistry by Nasi Puri.
16. Organic synthesis by Smith.

# Semester-III
# Paper-VI- Inorganic Chemistry

**Total Credits : 3**
**(45 Contact hrs.)**

**UNIT-I**

**1. Co-ordination Chemistry : (16)**

1.1 Definition and formation of co-ordinate covalent bond in $BF_3$: $NH_3$ and in $[NH_4]^+$ .
1.2 Distinction between double salt and complex salt,
1.3 Werner's theory : A. Postulates of theory,
B. Applications of theory:
Theory applied to cobalt amine viz;
a].$CoCl_3.6NH_3$ b] $CoCl_3.5NH_3$, c] $CoCl_3.4NH_3$, d] $CoCl_3.3NH_3$
C. Limitations
1.4 Description of terms –a] ligand, b]co-ordination number,
c] co-ordination sphere, d]effective atomic number,
e] Geometrical isomerism and optical isomerism in co-ordination compounds for CN = 4 and CN = 6.
1.5 IUPAC nomenclature of co-ordination compounds,
1.6 Valence bond theory of transition metal complexes.
A .Introduction
B. Postulates of VBT/ basic concepts of VBT
C. Role of transition metal in the formation of complex
D. Stepwise process of formation of complex : Salient featers
E. Applications : High spin and low spin complexes w.r.t. CN = 4 and CN = 6.
F. Limitations of Valence bond theory.

**2. Chelation (07)**

2.1 A brief introduction w.r.t. ligand, chelating agent, chelation and metal chelate.
2.2 Structural requirements of chelate formation.
2.3 Difference between metal chelate and metal complex.
2.4 Classification of chelating agents (with specific illustrations of bidentate chelating agent).
2.5 Applications of chelation w.r.t. chelating agents : EDTA and DMG.

**UNIT-II**

**3. Acids and Bases (07)**

3.1 Lewis Concept : A.Definition, B.classification,C. merits and D.demerits.
3.2 Hard and soft acids and bases (HSAB) :
A. Classification of acids and bases as hard and soft,
B. Pearson's HSAB concept,
C. Acid-Base strength and hardness-softness,
D. Applications and limitations of HSAB principle.

**4. Study of d-block elements (15)**

5.1. Introduction,
5.2. Position of d-block elements in periodic table,
5.3.Names & electronic configuration of $1^{st,}$ $2^{nd}$ & $3^{rd}$ three transition series.
5.4. General Characteristics of 3 d-block elements w.r.t. –
a) oxidation state b) colour c) Magenetic behavior (spin only formula)
d) catalytic properties and e) tendency to form complexes.

5.5. Comparison of 1st transition series with 2nd & 3rd transition series w.r.t. –

a) electronic configuration b) reactivity c) stability of oxidation state
d) magnetic behavior and e) stability of complexes (Brief account only)

**Reference Books :**


1. Concise Inorganic Chemistry by J.D. Lee ELBS $4^{th}$ & $5^{th}$ Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.
4. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
5. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
6. Inorganic Chemistry by Agrawal.
7. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
8. Selected topics in Inorganic Chemistry : Madan, Malik Tuli, S. Chand & Company.
9. Vogel's Text Book of Quantitative Inorganic Analysis–Bassett, Denny, Jeffery Mendham.
10. Basic concepts of Analytical Chemistry by S.M. Khopkar.

# Semester-IV
# Paper-VII- Physical Chemistry

**Total Credits : 3**
**(45 Contact hrs.)**

**UNIT-I**

**1. Electrochemistry : (18)**

1.1. Introduction, conduction of electricity, Types of conductors : electronic and electrolytic.

1.2. Explanation of terms : Conductance, Specific resistance, specific conductance, Equivalent conductance, Molecular conductance.

1.3. Variation of specific and equivalent conductance with concentration, Equivalent conductance at infinite dilution. (Mention Onsager equation, $\lambda_v = \lambda_\infty - b\sqrt{c}$ from graph)

1.4. Migration of ions, Hittorf's rule, Transport number, Determination of transport number by moving boundary method, factors influencing transport number: Nature of electrolyte, concentration, temperature, complex formation and Degree of hydration.

1.5. Kohlrausch law, Applications of Kohlrausch law :

i. Determination of relationship between ionic conductance, ionic mobility and transport number.
ii. Determination of equivalent conductance at infinite dilution of weak electrolytes.
iii. Determination of degree of dissociation of weak electrolyte.
iv. Determination of ionic product of water.
v. Determination of solubility of sparingly soluble salts.

1.6. Numerical problems.

**2. Thermodynamics (10)**

2.1. Introduction, concept of entropy, Entropy as a state function: Definition, mathematical expression, unit, physical significance of entropy.

2.2. Entropy changes for reversible and irreversible processes in isolated systems.

2.3. Entropy changes for an ideal gas as a function of V and T and as a function of P and T.

2.4. Entropy change in mixing of gases.

2.5. Entropy change in physical transformations :

i. Fusion of a solid.
ii. Vaporization of a liquid.
iii. Transition from one crystalline form to another.

2.6. Third law of thermodynamics, Absolute entropy and Evaluation of absolute entropy, use of absolute entropies: Determination of entropy changes in chemical reactions.

2.7. Numerical problems.

**UNIT-II**

**3. The Solid State (10)**

3.1. Introduction, space lattice, lattice sites, lattice planes, Unit Cell.

3.2. Laws of crystallography :

i. Law of constancy of interfacial angles.
ii. Law of rational indices
iii. Law of crystal symmetry.

3.3. Weiss indices and Miller indices.

3.4. Cubic lattice and types of cubic lattice, planes or faces of a simple cubic system, spacings of lattice planes.

3.5. Diffraction of X-rays, Derivation of Bragg's equation.

3.6. Determination of crystal structure of NaCl and KCl on the basis of Bragg's equation.

3.7. Numerical problems.

**4. Distribution Law** **(07)**

4.1. Introduction

4.2. Nernst distribution law, its limitations and modification with respect to association and dissociation of solute in one of the solvents

4.3. Applications of distribution law in

i. Process of extraction (derivation expect)
ii. Determination of solubility
iii. Distribution indicators
iv. Determination of molecular weight

4.4. Numerical problems expected

**List of Reference Books :**


1) Elements of Physical Chemistry : S. Glasstone and D. Lewis (D.Van Nostrand Co. Inc)
2) Physical Chemistry : W.J. Moore (Orient Longman)
3) Principles of Physical Chemistry : Maron & Prutton (Oxford IVth Edn.)
4) Chemistry Principle & Applications : P.W. Atkins, M.J. Clugsto, M.J. Fiazer, R.A.Y. Jone (Longman)
5) Physical Chemistry : G.M. Barrow (Tata Mc-Graw Hill)
6) Essentials of Physical Chemistry : B.S. Bahl & G.D. Tuli (S. Chand)
7) Physical Chemistry: Daniels – Alberty.
8) Principles of Physical Chemistry : Puri – Sharma (S. Nagin)
9) Basic Chemical Thermodynamics : V.V. Rao.
10) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)
11) Physical Chemistry: S. Glasstone.
12) Text book of Physical Chemistry – S. Glasstone ($2^{nd}$ Edn. Mac Millan)
13) Elements of Physical Chemistry – P. Atkins & J. Paula (Oxford IVth Edn.)
14) Principles of Physical Chemistry : B. R. Puri, L. R. Sharma and M. S. Pathania
15) Electrochemistry : S. Glasstone

# Semester-IV

## Paper- VIII- Analytical & Industrial Inorganic Chemistry

**Total Credits: 3**
**(45 Contact hrs.)**

**UNIT-I**

**1. Volumetric Analysis: (10)**

1.1 Introduction, Terminology:- Titrant; Titrand, standard solution; Titration Indicator; Equivalence point; End point.Primary standard ,Secondary standard. Strength of solution, volumetric analysis & their types.

1.2 Acid Base Titration

i) Introduction

ii) Theory of Acid-Base indicator :

A) Colour change Interval

B) Theories-Ostwald's theory & Quinoid theory,

iii) Neutralization curve and choice of indicator for following titrations :

A) Strong acid and Strong Base

B) Strong Acid and Weak Base

C) Weak Acid and Strong Base

1.3 Complexometric titration:

A) General account,

B) Types of EDTA Titrations,

C) Metallochromic Indicator w.r.t. Eriochrome Black-T

**2. Gravimetric Analysis: (10)**

2.1. Introduction, Terminology :-Gravimetric analysis, Saturation, Super-saturation, Sol, Gel, Coagulation or Flocculation, Coagulation or Flocculation value, Peptisation, Precipitation, Precipitate, Precipitant, Solubility, Aging or digestion, Ignition,

2.2. General steps involved in gravimetry

2.3. Precipitation – A) Physical nature of Precipitate: Gelatinous, Curdy and Crystalline.
B) Conditions of Precipitation

2.4. Process of precipitation – A) Nucleation B) Crystal growth C) Digestion

2.5. Co-precipitation and Post precipitation and their difference.

2.6. Role of Organic precipitants in gravimetric analysis,

2.7. Study of organic precipitants viz. A) DMG, B) Aluminon, C) 8- Hydroxy quinoline.

2.8. Advantages and disadvantages of organic precipitants.

**UNIT-II**

**3. Industrial heavy Chemicals (07)**

3.1. Introduction

3.2. Physicochemical Principles & manufacture of following heavy chemicals:

i) Ammonia by Haber process

ii) Sulphuric acid by contact process.

**4. Metallurgy** **(08)**

4.1. Introduction: Terminology:- Metallurgy, Mineral, Ore, Gangue, Flux, Slag.

4.2. Occurrence of metals: Types of ores

4.3. Steps involved in metallurgical processes:

A) Concentration of ores-

I. Physical methods:

a) Gravity separation method, b) Magnetic separation method, c) Froth flotation process.

II. Chemical Methods:

a) Calcination b) Roasting

B) Reduction- i) Chemical methods of reduction

ii) Electrolytic reduction method for e.g. Aluminium and copper

**5. Iron and Steel** **(10)**

5.1 Occurrence of Iron

5.2 Extraction of Iron: Blast furnace

5.3 Types of Iron

5.4 Steel-

A) Definition

B) Types of Steel

C) Manufacture of Steel: a) Bessemer process b) L. D. process

D) Heat treatment on Steel

**List of Reference Books :**


1. Concise Inorganic Chemistry by J.D. Lee ELBS $4^{th}$ & $5^{th}$ Edn.
2. Basic Inorganic Chemistry by F.A. Cotton, G.Wilkinson and P.L. Gaus Wiley.
3. Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
4. Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
5. Inorganic Chemistry by G.S. Manku Tata Mc. Graw Hill.
6. Inorganic Chemistry by Agrawal.
7. Industrial Chemistry by B.K. Sharma.
8. Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
9. Text book of Quantitative Inorganic Analysis by A.I. Vogel.
10. Vogel's Text Book of Quantative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.
11. Basic concepts of Analytical Chemistry by S.M. Khopkar.

# Laboratory Course (Practicals) Chemistry

University practical Examination : 80 marks

Internal practical Examination : 20 marks

Total 100 Marks = Credits : 2

## B.Sc.II-Chemistry practical Exaimination-pattern

**Mark Distribution**

| * University Examination : (Two Day Exam) | Expt | Journal | Oral | Total |
|---|---|---|---|---|
| Q.1: Physical Chemistry Experiment | 15 | 3 | 5 | 23 |
| Q.2 : Inorganic Chemistry Experiment | 25 | 4 | 5 | 34 |
| Q.3 : Organic Chemistry Experiment | 15 | 3 | 5 | 23 |

*** Internal Examination :**

Practical paper has 20 marks for Internal Examination.

There will be **two** practicals of 10 marks each.

**Note :** i) Use of Electronic / Single pan balance / Digital balance is allowed.

ii) Use of scientific calculator is allowed.

iii) Use S.I. Units wherever possible.

# Laboratory Course Physical Chemistry

**A) Instrumental**

1. Viscosity : To determine the percentage composition of a given liquid mixture by viscosity method. (Density data be given)
2. Refractometry : To determine the specific and molar refractions of benzene, tolyene and xylene by Abbe's refractometer and hence determine the refraction of $-CH_2$ group. (Densities should be determined by the students.)
3. Polarimetry : To determine the specific rotation and find unknown concentration of sugar solution.
4. Conductometry : (any two)
   i. To determine degree of dissociation and dissociation constant of acetic acid at various dilutions and to verify Ostwald's dilution law conductometrically.
   ii. To determine the normality of the given strong acid by titrating it aginst strong alkali conductometrically.
   iii. To determine the equivalent conductance at infinite dilution of strong electrolyte at five different dilutions conductometrically. (e.g. any one from KCl, NaCl, $KNO_3$ and HCl) and verify Onsager equation.

**B) Non-Instrumental**

**1. Chemical Kinetics ( ANY THREE)**

i. To study the hydrolysis of methyl acetate in presence of HCl and $H_2SO_4$ and to determine the relative strong of acids.
ii. To study the effect of acid strength (0.5M and 0.25M HCl) on hydrolysis of an ester.
iii. To study the reaction between $K_2S_2O_8$ and KI (unequal concentration)
iv. To study the reaction between $KBrO_3$ and KI (equal concentrations)

**Reference Books :**


1. Experimental Physical Chemistry by A. Findlay Longman.
2. Experiments in Physical Chemistry by R.C. Das & B. Behra. Tata Mc Graw Hill.
3. Advanced Experimental Chemistry Vol. I Physical by J.N. Gurtu and R. Kapoor S. Chand & Co.
4. Experiments in Physical Chemistry by J.C. Ghosh, Bharati Bhavan.
5. Practical book of Physical Chemistry – by Nadkarni Kothari Lawande. Bombay Popular Prakashan.
6. Systematic Experimental Physical Chemistry – by S.W. Rajbhoj, Chondhekar. Anjali Publication.
7. Practical Physical Chemistry – by B.D. Khosala & V.C. Garg R. Chand & Sons.
8. Experiments in Chemistry by D.V. Jagirdar.

# Practical Course Inorganic Chemistry

1. **Gravimetric Analysis :**
   i. Gravimetric estimation of Fe as $Fe_2O_3$ from a solution containing ferrous ammonium sulphate and free sulphuric acid.
   ii. Gravimetric estimation of Ba as $BaSO_4$ from a solution containing barium chloride and free hydrochloric acid.
2. **Titrimetric Analysis :** Calibration of burette, pipette and volumetric flask.
   i. Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.
   ii. To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.

**3. Inorganic Preparations :**

i. Ferrous Ammonium Sulphate (Mohr's salt)

ii. Preparation of tetramminecopper(II) sulpate

iii. Preparation of Chlorpentamminecobalt(III) chloride

iv. Preparation of hexamminenickel (II) chloride.

**4. Semi-micro Qualitative Analysis :**

Cations : $Cu^{++}$, $Al^{+++}$, $Fe^{+++}$, $Mn^{++}$, $Zn^{++}$, $Ni^{++}$, $Ba^{++}$, $Ca^{++}$, $Mg^{++}$, $NH_4^+$, $K^+$

Anions : $Cl^-$ , $Br^-$, $I^-$, $SO_4^{2-}$, $NO_3^-$, $CO_3^{2-}$

**Note : At least SIX mixtures to be completed.**

**Reference Books :**

1. Quantitative Inorganic Chemistry – A.I. Vogel.

2. Practical Chemistry – Physical – Inorganic – Organic and Vice-voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.

3. Inorganic Qualitative Analysis – A.I. Vogel.

4. Basic Concepts in Analytical Chemistry – S.M. Khopkar.

5. Vogel's Text Book of Quantitative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.

**N. B. – 1. Calculations of % yield is expected.**

2 After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in terms of:

a) Name of central metal ion

b) Oxidation number of metal ion

c) Nature of ligand

d) Nature of bonding

e) Type of hybridization

f) Inner orbital or outer orbital complex

g) Geometry of the complex with structure

h) Magnetic property of the compound

i) Color of the compound

j) Nature :Crystalline /Amorphous

**(Note: Preparation should be take in semester-III)**

# Laboratory Course Organic Chemistry

**A) Organic Qualitative Analysis :**

Identification of at least **Eight organic compounds** with reactions including two from acids, two from phenols, two from bases and two from neutrals.

- **Acids :** succinic acid, phthalic acid, salicylic acid, aspirin
- **Phenols :** α– naphthol, o-nitrophenol, p-nitrophenol
- **Bases :** o-, m-, and p-nitroanilines N, N-dimethylaniline
- **Neutral :** urea, acetanilide, carbontetrachloride, bromobenzene, methylacetate, nitrobenzene, naphthalene, anthracene, acetophenone, ethylmethyl ketone.

**Note :** A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the determination of elements and functional group.

1) Preliminary tests and physical examination
2) Determination of type
3) Determination of physical constant
4) Detection of elements
5) Determination of functional group
6) A search into the literature
7) Special test if any
8) Summary
9) Result.

**B) Organic Quantitative Analysis :**

**i. Estimations (Any Two)**

1. Estimation of ester
2. Etimation of acetone
3. Estimation of ibuprofen from ibuprofen tablet

**ii. Organic Preparations (Any Three)**

1. Preparation of phthalimide from phthalic anhydride.
2. Preparation of p-bromoacetanilide from acetanilide.
3. Preparation of m-dinitrobenzene from nitrobenzene using $NaNO_2$ and conc. $H_2SO_4$.
4. Preparation of acetanilide from aniline using acetic acid and anhydrous zinc chloride.
5. Preparation of p-nitroethylbenzoate from p-nitrobenzoic acid

**Reference Books :**


1. Practical Organic Chemistry by A.I. Vogel.
2. Hand book of Organic qualitative analysis by H.T. Clarke.
3. A laboratory Hand Book of Organic qualitative analysis and separation by V.S. Kulkarni. Dastane Ramchandra & Co.
4. Practical Organic Chemistry by F.G. Mann and B.C. Saunders. Low – priced Text Book. ELBS. Longman.
5. Experiments in General Chemistry by C.N.R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.
6. Advanced Practical Organic Chemistry by N.K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V.K. Ahluwalia, Sunita Dhingra. University Press. Distributor-Orient Longman Ltd.
8. Practical Chemistry – Physical – Inorganic – Organic and Viva – voce by Balwant Rai Satija. Allied Publishers Private Limited.
9. Experimental organic chemistry by J. R. Norris, published by Sarup and sons, Delhi
10. Advanced practical chemistry by J. Singh, L. D. S. Yadav, R. K. P. singgh, I. R. Siddiqui et.al, Pragati prakashan.


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# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: Computer Science

## Name of the Course: B.Sc. II (Sem–III & IV)

**(w.e.f. June 2020)**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**Syllabus for B.Sc. Part – II (CBCS Semester Pattern)**

**Computer Science**

**(W.E.F. June 2020)**

## Introduction

B.Sc-II (Computer Science) CBCS Semester wise pattern to be introduced from June 2020. The Details of syllabus is as follows.

| Semester No. | Type of the Paper | Paper No. | Title of the Paper | University Exam. | Internal Exam. | Total | Credits |
|---|---|---|---|---|---|---|---|
| III | DSC 1C | Paper-V | Data Structure | 40 | 10 | 50 | 4 |
| | | Paper-VI | Design analysis and algorithm | 40 | 10 | 50 | |
| | SEC -I | | AngularJS | 40 | 10 | 50 | 2 |
| IV | DSC 1D | Paper-VII | Software Engineering | 40 | 10 | 50 | 4 |
| | | Paper-VIII | Database Management System | 40 | 10 | 50 | |
| | SEC -II | | PHP | 40 | 10 | 50 | 2 |
| Annual Examination | | Practical | Paper –II (Practical on paper V) | 40 | 10 | 50 | 4 |
| | | | Paper –III (Practical on paper VIII) | 40 | 10 | 50 | |
| **Total (Without SEC-I & SEC-II)** | | | | **240** | **60** | **300** | **12** |

**Note**: Nature of internal examination, passing standard, ATKT and the conversion of marks into grades and credits are as per guidelines of Science Faculty Credit and Grading System.

**Teaching Periods:**

1. Total teaching periods for each theory paper (Paper-V to VIII) is three periods per week
2. Total teaching periods for each practical Paper- II and Paper-III are four periods per week per paper per batch.
3. Total Teaching periods for SEC is 2.5 periods per week

Equivalence papers for B.Sc-II Sem III and IV ( Computer Science )

| Sr.no. | Old Paper | New Paper |
|---|---|---|
| 1 | Object oriented programming using C++ | No equivalence |
| 2 | Software Engineering | Paper VII-Software Engineering |
| 3 | Data structure | Paper V-Data Structure |
| 4 | DBMS using oracle | Paper VIII-Database Management System |

# Semester – III

# Computer Science Paper – V: Data Structures

**Course objectives:**

1. To impart the basic concepts of data structures and algorithms
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs
4. To impart the basic concepts of data structures and algorithms

## Unit 1 (15)

Introduction of Data Structure, Need of Data Structure, Types of Data Structure, ADT,

Stack: Introduction to stack, Representation-static & dynamic, stack Operations, Application -infix to postfix & prefix, postfix evaluation, recursion, expression validity.

Queues: Introduction to Queue, Representation -static & dynamic, Operations, Circular queue, Double ended queue, priority queues, Applications of Queue.

## Unit 2 (15)

Linked List:-Introduction to List, Implementation of List – static & dynamic representation, Types of Linked List, Operations on List, Applications of Linked List – polynomial manipulation

Trees: Concept & Terminologies, Binary tree, binary search tree, Representation – static &dynamic, Operations on BST – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes, Height balance tree- AVL,B tree,B+ Tree,

Graph- Graph terminology, Representation of graphs, Graph Traversal–BFS (breadth first search),DFS (depth first search), Minimum spanning Tree

## Unit 3 (15)

Sorting: Bubble sort, Quick sort, Simple Insertion sort, Shell sort, Address calculation sort, Selection Sort, Heap Sort, Merge sort, Radix Sort.

Searching: Linear Search, Binary Search, and Tree searching methods, Multiway search tree, Hash function (open and close).

**Course Outcome:-**

After learning the course the students should be able:

1. Differentiate primitive and non-primitive structures
2. Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem
3. Design and apply appropriate data structures for solving computing problems.
4. Apply sorting and searching algorithms to the small and large data sets.

**Reference Books**


1. Data Structures and Algorithms‖, Pearson Education, Reprint 2006 by Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman
2. Algorithms, data structures, Programs by Nikaulus Wirth:
3. File Systems, Structures and Algorithms (PHI). By Thoms Horbron:
4. Art of computer Programming Vol – I. by D. E. Kunth:
5. Data structures using C and C++ (PHI). By Tanenbaum:
6. Fundamentals of computer algorithms by 2nd edition galgotia publication by Ellis horowitz, sartaj sahni

# Computer Science Paper – V: Design and Analysis of Algorithms

**Course objectives:**

1. To understand and apply the algorithm analysis techniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3. To understand different algorithm design techniques.
4. To understand the limitations of Algorithmic power.

## Unit 1 (15)

What is an algorithm?, Algorithm: Definition, characteristics, Space complexity, time complexity, Asymptotic notation (Big O, Omega Ω ,theta Φ, Fundamentals of Algorithmic Problem Solving , Important Problem Types, Fundamentals of the Analysis of Algorithmic Efficiency , The efficient algorithm, Average, Best and worst case analysis, Amortized analysis , Asymptotic Notations properties, Analyzing control statement, Loop invariant and the correctness of the algorithm. Analysis Framework, Empirical analysis, Mathematical analysis for Recursive and Non-recursive algorithms, Visualization

## Unit 2 (15)

Brute Force – Computing an – String Matching – Closest-Pair and Convex-Hull Problems – Exhaustive Search – Travelling Salesman Problem – Knapsack Problem – Assignment problem. Divide and Conquer Methodology – Introduction, Recurrence and different methods to solve recurrence, Multiplying large Integers Problem, Problem Solving using divide and conquer algorithm - Binary Search, Max-Min problem, Sorting (Merge Sort, Quick Sort), Matrix Multiplication, Exponential, Multiplication of Large Integers – Closest-Pair and Convex – Hull Problems.

Dynamic programming – Principle of optimality – Coin changing problem, Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem – Prim's algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern – Huffman Trees, All Points Shortest path, Matrix chain multiplication, Longest Common Subsequence.

## Unit 3 (15)

The Simplex Method – The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem

Backtracking and Branch and Bound Introduction, The Eight queens problem , Minimax principle, String Matching:-Introduction, The naive string matching algorithm, The Rabin-Karp algorithm, String Matching with finite automata, The Knuth-Morris-Pratt algorithm.

Lower – Bound Arguments – P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem – Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search – Assignment problem – Knapsack Problem – Travelling Salesman Problem – Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

**Course Outcome:-**

At the end of the course, the student should be able to:

1. Design algorithms for various computing problems.
2. Analyze the time and space complexity of algorithms.
3. Critically analyze the different algorithm design techniques for a given problem.
4. Modify existing algorithms to improve efficiency.

**Reference Books**


1. Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012. By Anany Levitin
2. Introduction to Algorithms‖, Third Edition, PHI Learning Private Limited, 2012 by Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein
3. Data Structures and Algorithms‖,Pearson Education, Reprint 2006 by Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman
4. The Algorithm Design Manual‖, Second Edition, Springer, 2008. By Steven S. Skiena,
5. Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
6. Foundations of Algorithms, by Shailesh R Sathe, Penram
7. Design and Analysis of Algorithms, Dave and Dave, Pearson.

# Computer Science Paper – SEC –I- AngularJS

**Course objectives:**

1. Understanding Basic concept of AngularJS
2. Properly separate the model, view, and controller layers of your application and implement them using AngularJS
3. Master AngularJS expressions, filters, AngularJS directives and scopes
4. Build Angular forms
5. Understand the design of single-page applications and how AngularJS facilitates their development

## Unit-1 (10)

What is AngularJS?, Why AngularJS?, Features of AngularJS, AngularJS architecture, Setting up the Environment, Model-View-Controller explained, My first AngularJS app

All about Angular expressions, How to use expressions, Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behaviour, Angular expressions v/s Javascript expressions

## Unit-2 (20)

Built-in filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrederBy Filter, Filter Filter, Using AngularJS filters, Creating custom filters

Introduction to AngularJS Modules, Module Loading and Dependencies, Creation vs Retrieval, Bootstrapping AngularJS

Role of a Controller, Attaching properties and functions to scope, Nested Controllers, Using filters in Controllers, Controllers in External Files, Controllers & Modules, Controllers

Introduction to Directives, Directive lifecycle, Using AngularJS built-in directives, Core Directives, Conditional Directives, Style Directives, Mouse and Keyboard Events Directives, Matching directives, Creating a custom directive

## Unit-3 (15)

Working with Angular Forms, Model binding, Understanding Data Binding, Binding controls to data, Form controller, Validating Angular Forms, Form events, Updating models with a twist, $error object

What is scope, Scope lifecycle, Two way data binding, Scope inheritance, Scope & controllers, Scope & directives, $apply and $watch, Rootscope, Scope broadcasting, Scope events

Single Page Application (SPA)-what is SPA, Pros & Cons of SPA, Installing the ngRoute module, Configure routes, Passing parameters, Changing location, Resolving promises, Create a Single Page Application

AngularJS Animation - ngAnimate Module, CSS transforms, CSS transitions, Applying animations, Directives supporting animation

**Course Outcome:-**

At the end of the course, the student should be able to:

1. Build an awesome User Interface
2. Create and bind controllers with JavaScript
3. Validate user input data
4. Write own filters, directives and controls
5. Create animation in web page and Create single page application

**Reference Books:**


1. Professional AngularJS by Diego Netto and Valeri Karpov-Wrox press
2. Learning AngularJS by Brad Dayley- Addison-Wesley Professiona
3. AngularJS by Brad Green and Shyam Seshadri- O'Reilly
4. Pro AngularJS by Adam Freeman-APress
5. Learning AngularJS: A Guide to AngularJS Development by Ken Williamson-O'Reilly Media
6. Beginning AngularJS by Andrew Grant-Apress

# Semester – IV

## Computer Science Paper – VII: Software Engineering

**Course objectives:**

1. To study fundamental concepts in software engineering, SDLC, software requirements specification, formal requirements specification and verification.
2. To study the basic techniques for improving quality of software.
3. Understand the fundamental principles of Software Engineering & will also have a good knowledge of responsibilities of project manager and how to handle these.
4. To understand the basic knowledge of different models.

## Unit 1: (15)

System concepts: Introduction, Definition, Elements of system, system concepts, Types of system, System Analysis, Role of System Analyst.

Software Engineering: Definition, Characteristics of software, Qualities of software. System Development life cycle, Process Models-Waterfall model, v shape model, Spiral model, Prototyping, incremental, RAD

## Unit 2: (15)

Requirement Analysis, Fact finding techniques: Interviews, Questionnaire, Record reviews, Observation, Basic and User design requirements, Organization Dependent Requirements,

Analysis and Design Tools: Flow charting, Decision tables, Decision Trees, Structure charting Techniques (HIPO).

System Design: Data flow Diagram (Physical, Logical), Entity relation diagram, Input output design, structured chart

## Unit 3: (15)

Configuration of the System: Collection of system statistics, Setting Sub-system Boundaries. Construction of the system: traditional and incremental approaches, conversion methods, Software Testing: Need of Testing, types of testing, Software Implementation and maintenance, System Development Tools: Role, Benefits and weakness of case Tools, Taxonomy of case tools,

Case studies: Pay Roll, Fixed Deposit, Inventory system, College Admission System, Library System, Loan system.

**Course Outcome:-**

At the end of the course, the student should be able to:

1. Basic knowledge and understanding of the analysis and design of software systems.
2. Ability to apply software engineering principles and techniques to develop, maintain and evaluate large-scale software systems.
3. To produce efficient, reliable, robust and cost-effective software solutions.
4. Ability to perform independent research and analysis.
5. Ability to work as an effective member or leader of software engineering teams.

**Reference Books:**


1. Analysis and Design of Information Systems By James Senn.
2. System analysis and Business application (for case studies) By Rajesh Nike / swapna kishore.
3. Software Engineering By Pressman.
4. System Analysis and Design By Parthsarty / Khalkar.
5. Practical guide to structure System Design By Miller/Page/jones.

# Computer Science Paper – VIII: Database Management System

**Course objectives:**

1. To understand the fundamental concepts of database.
2. It helps in developing skills for the design and implementation of a database applications
3. To understand user requirements and frame it in data model.
4. To understand creations, manipulation and querying of data in databases.
5. Undersetting SQL and PL/SQL

## Unit 1: (15)

Introduction to database system:-Definition, Limitations of traditional file system, Advantages of DBMS, Components of DBMS, Database Architecture, Database Users, Schemas and instances, 2 tier and 3 tier architecture, Database languages, Types of data models- relational, Network, Hierarchical, Distributed

E-R model: E-R Diagram, entities, attributes and its types, Relationship and relationship sets, Cardinality, Degree, Generalization, Specialization, Aggregation

Relational Model and Database design:-Relation, Domain, Tuples, types of keys, relational integrity rules, Dr. Codd's rules,

Relational Algebra operations:- Select, Project, Cartesian Product, Union, Set difference, Natural Join, Outer Join,

Dependencies and its types, Normalization and its types-1NF, 2NF, 3NF, BCNF, lossless joins, Data dictionary. Case study

## Unit 2: (10)

Transaction Management & Concurrency Control: -Introduction, Definition, properties, transaction states, scheduling and its types, conflict and view serializability,

Introduction to Concurrency Control, problems of concurrency control. lock based protocols, timestamp based protocol, deadlock, deadlock handling.

Database recovery and Atomicity:-Introduction, recovery algorithms, log base recovery, shadow paging, checkpoints or syncpoints or savepoints.

## Unit 3: (20)

History of MySQL, Installation of MYSQL, MySQL Architecture, Invoking MySQL through Command Line, MySQL Server Start and Stop, Overview of Data Types in MySQL, Defining a Database, Creating Tables and Fields in MySQL

SQL & Procedural Language in MySQL:-DDL, DML,DCL queries, Simple Queries, Expressions, Conditions and Operators, Functions, Groupby-having, Where clause, Joins, Sub queries, Views, indexes, sequences. Blocks, Conditional statement and loops, Cursors and types, procedures and functions, packages, trigger, Exception Handling.

**Course Outcome:-**

At the end of the course, the student should be able to:

1. Demonstrate the concepts of Relational database model , ER model and Distributed databases.
2. Design E-R Model for given requirements and convert the same into database tables
3. Implement database operations and transactions using SQL.
4. Apply the concepts of Transaction processing, Concurrency control, Database Recovery and Back-up in applications.
5. Use database techniques such as SQL & Procedural Language in MySQL.

**Reference Books:**


1. Database System Concepts By KorthSilberschetz
2. Fundamentals of Database Systems by Elmsari, Navathe
3. Teach Yourself SQL in 14 Days by Jeff Parkins and Bryan Morgan
4. An Introduction to Database Systems by Bipin Desai
5. SQL and PL/SQL Programming by Ivan Bayross
6. SQL and PL/SQL Programming by Oracle Press
7. MySQL(TM): The Complete Reference by Vikram Vaswani
8. MySQL Cookbook by Paul DuBois

# Computer Science Paper – SEC –II-PHP

**Course objectives:**

1. To understand the fundamental concepts of PHP.
2. To acquire knowledge and skills for creation of web site considering both client and server side To gain ability to develop responsive web applications
3. To understand OOP concepts with PHP.
4. Able to develop Dynamic web applications

## Unit-1 (15)

Introduction, Basics of PHP: History of PHP, features of PHP, Interfaces to External systems, Hardware and Software requirements, Benefits of PHP as a server side languages, How PHP works with the web server, Installation and Configuration files, PHP Framework, Basic PHP syntax, PHP data types, Displaying type information, Testing for specific data type, Changing type with Set type, Operators, Variable manipulation, Dynamic variables, Static vs. Dynamic Optimization, Redirecting web pages

Control Structures If condition Statement, The switch statement, Using the ? operator, While, do while and for Loop, Breaking out of loops, Nesting loops

Array, String and Functions:, Array: Single-Dimensional Arrays , Multidimensional Arrays, Associative arrays, Accessing arrays, Getting the size of an array, Examining arrays, merging arrays, Sorting arrays, Sorting an associative arrays, String:, Formatting String for Presentation, Formatting String for Storage Joining and Splitting String, Comparing String, Matching and replace Substring, patterns, The basic regular expressions, Matching patterns, Finding matches

Function :- Function and its Types , Library Function, Array functions, String functions, Date and time functions, Maths functions, User-defined functions, Creating a function, Returning value from function, Dynamic function calls, Variable scope, Accessing variable with the global statement, Function calls with the static statement, Setting default

values for arguments, Passing arguments to a function by value, Passing arguments to a function by reference, Using require() and include()

## Unit-2 (20)

Object Oriented Programming in PHP: Object oriented concepts, Define a class and objects, Class attributes, Object properties, Object methods, constructors and destructors, Class constants, Static method, inheritance, Abstract classes, Exception Handling, Final keyword, Implementing Interface, Object serialization, Understanding Advance and New, Checking for class and method existence, File Handling-reading and writing file.

## Unit-3 (10)

Working With Forms and Database (MySQL):Working With Forms:, Forms, Forms controls properties, methods and events, Retrieving form data with $_POST, $_GET and $_REQUEST arrays, Validating retrieved data, Strategies for handling invalid input, Super global variables, Super global array, Importing user input, Accessing user input, Combine HTML and PHP code, Using hidden fields, Redirecting the user, File upload and scripts, Validation :-Server side validation, Client side validation (Java script)

Working with Database MySQL:-Working with PHP-MySQL Environment, Connecting to the MYSQL, Selecting a database, Adding data to a table, Displaying returned data on Web pages, Finding the number of rows, Inserting, deleting and updating data, Executing multiple queries,

State Management- Cookies: What is a Cookie?, Setting time in a cookie with PHP, Deleting a cookie, Creating session cookie, Working with the query string, Session:- What is session?, Starting a session, Registering Session variables, working with session variables , destroying session, passing session Ids, encoding and decoding session variables.

**Course Outcome:-**

At the end of the course, the student should be able to:

1. Write PHP scripts to handle HTML forms.
2. Create PHP programs that use various PHP library functions, and that manipulate files and directories.
3. Validate user input
4. Analyze and solve various database tasks using the PHP language.
5. Analyze and solve common Web application tasks by writing PHP programs.

**Reference Books:**


1. PHP: The Complete Reference-Steven Holzner.
2. Professional PHP 5-Ed Lecky-Thompson, HeowEide-Goodman, Steven D. Nowicki, Alec Cove.
3. Programming PHP-Rasmuslerdorf, Kevin Tatroe.
4. Beginning PHP 5.3 –Wrox Plublication-Matt Doyle
5. Learning php, mysql, javascript and css –Oreilly-Robin Nixon

# Sample Practical Assignment on Data Structure

1. Write a program on recursive function
2. Write a program to implement stack using array.
3. Write a program to implement stack using list.
4. Write a program to check whether the expression is valid or not.
5. Write a program to convert infix expression to postfix.
6. Write a program to implement queue using static.
7. Write a program to implement queue using dynamic method.
8. Write a program to implement Circular queue.
9. Write a menu driven program to implement singly, doubly, singly circular , doubly circular linked list with operation a) insert at beginning of linked list b) insert at specific position c) insert at end d) delete the first node e) delete specific node f) delete last node g) display the list
10. Write a menu driven program to implement singly linked list with operation a) sort list b) maximum value c) minimum value d) find & replace a value e) count the number of nodes.
11. Write a program to create binary search tree and display its contents by using inorder, preorder and postorder traversal method.
12. Write programs to implement a) Bubble Sort Technique. b) Straight Selection Sort Technique. c) Simple Insertion Sort Technique. d) Shell Sort Technique. e) Quick Sort Technique. f) heap sort technique. g) address calculation Sort Technique. h) Radix Sort Technique. i) Merge Sort Technique.
13. Write programs to implement a) sequential searching Technique. b) indexed searching Technique. c) Binary searching technique
14. Write a program to add, subtract two polynomials by using Linked list
15. Write a program to implement Graph traversing technique.

# Sample Practical Assignment on Database Management System

1. Create table employee ( eno, name, dept, basic salary, HRA, tax, deduction). Dept are D1, D2, D3 and D4. Use constraints.
    a. Insert 20 records.
    b. Display total amount spend by company on salary.
    c. Display name of dept for which company spend maximum amount.
    d. Display average salary of employee in company.
    e. Display average salary of each dept.
    f. Display total salary for each dept.
    g. Display highest salary for each dept.
    h. Display different between average of max salary for each dept and average of each dept.
    i. Display no of dept in the company.
    j. Display name of all employee whose basic pay is higher then average salary.
    k. Display average, minimum, maximum salary of each dept.
    l. Display dept average of dept whose employee >5.
2. Create following table. Book (id, title, author, publisher, category, year, price) Distributor( did, name, city, discount ) and Order(order_no, title, did, qty)
    a. Display title and category of all books.
    b. Display the total no of books per year.
    c. Display list of authors.
    d. Display the books published in 1991,92 and 93.
    e. Display the books published from 1991 to 95.
    f. Display the books whose price is greater than200.
    g. Display the total no of books of each category.
    h. Display titles of all books whose price is greater than average price.
    i. Display the list of all books whose price is greater then average price of "computer" category.
    j. Shoe the name of all the distributors who supply "software testing" books.
    k. Display the details of all books whose price is greater than the maximum of the category average.

l. Display name of all books who are supplying the books whose author is 'Pressman'.

3. Create the following table & solve given queries.

Table Name : branch

| Column_name | Datatype | Constraint | Description |
|---|---|---|---|
| Bno | number(4) | Primary key | Branch number |
| bname | Varchar2(20) | Not null | |
| City | Varchar2(15) | Not null | |

Table Name : customer

| Column_name | Datatype | Constraint | Description |
|---|---|---|---|
| Cust_no | Number(6) | Primary key | |
| Cust_name | Varchar2(20) | Not null | |
| City | Varchar2(15) | Not null | |

Table Name : deposit

| Column_name | Datatype | Constraint | Description |
|---|---|---|---|
| Acc_no | Varchar2(5) | Primary key | Starts from 'D'characcter |
| Cust_no | Number(6) | Foreign key | references table 'customer' |
| Bno | Number(4) | Foreign key | Branch number references from table 'branch' |

| | | | |
|---|---|---|---|
| Amount | Number(9,2) | Not null | Default amount is 500.00 |
| Adate | Date | Not null | Date of money deposited |

Table Name : borrow

| Column_name | Datatype | Constraint | Description |
|---|---|---|---|
| Loan_no | Number(5) | Primary key | |
| Cust_no | Number(6) | Foreign key | references table 'customer' |
| Bno | Number(4) | Foreign key | references from table 'branch' |
| Amount | Number(9,2) | Not null | Default amount is 500.00 |

a) Insert minimum 10 records.
b) describe tables, which are already created.
c) Give account number and amount of depositors.
d) Give names of borrowers.
e) Give names of customers living in city NAGPUR.
f) Give names of depositors having amount greater than 4000.
g) Give name of customer having living city BOMBAY and branch city DELHI.
h) Give names of customer having the same living city as their branch city.
i) Give name of customers who are borrowers as well as depositors and having living city NAGPUR.
j) Give name of customers who are depositors and have the same branch city as that of sunil.
k) Give names of depositors having the same living city as that of shivani and having deposit amount greater than 200.
l) Give names of borrowers having deposit amount greater than 1000 and loan amount greater than 2000.

m) Give names of borrowers having loan amount greater than the loan amount of anil.
n) Give loanno and loan amount of borrowers having the same branch as that of depositor sunil.
o) Give loanno, loan amount, account no, and deposit amount of customers living in city NAGPUR.

4. Write a block to find maximum number.
5. Write a block for check given number is even or odd.
6. Write a procedure for addition of two number.
7. Write a function which return multiplication of two numbers.
8. Define cursor for display information of student.
9. Write a procedure for addition and subtraction of two numbers. (Return result).
10. Create user A and B. create table student (roll_no, name) by user A. Create trigger for avoid update or delete in table by user B.
11. Create a package for addition and multiplication of two numbers.
12. Create trigger for avoiding inserting the records whose address 'solapur' and deleting the records whose address 'satara'.( use any table with address field).
13. Create package for addition, multiplication.
14. Create function with cursor.
15. Create package which contain procedure, function , cursor.

# Sample Practical Assignment on Angular JS

1. Write angular js app which display your name, college name, class.
2. Write angular js app which demonstrate one way and two way data binding.
3. Demonstrate ng-cut,ng-copy & ng-paste directive.
4. Demonstrate different directive related to mouse and keyboard events.
5. Demonstrate Conditional Directives.
6. Write angular js app which display list of employees in tabular for having different color for even odd row.
7. Write angular js app for creating custom directive which display current date and current time in elements, attributes, class and comment.
8. Demonstrate all types of Expressions used in angular js.
9. Demonstrate nested controller.
10. Demonstrate multiple controllers.
11. Demonstrate number, currency, Uppercase and Lowercase Filters.
12. Write angular js app for displaying current date in 10 different format using date filter.
13. Write angular js app which sort array object data in ascending and descending by using orderby filter.
14. Write angular js app which demonstrate filter filter and json filter.
15. Write angular js code for Creating custom filters.
16. Demonstrate filter in controller for following filter
    a. Filter
    b. Date
    c. Order by
17. Write angular js app which validate data for following validation
    a. Required
    b. Email
    c. Touched
18. Write angular js app which demonstrate all status properties.
19. Write angular js app for validate CSS class.
20. Write angular js code for custom validation.
21. Write angular js code which demonstrate $apply and $watch variable.

22. Write angular js code for all types of CSS animation.
23. Write angular js code for animation using nganimate directive.
24. Design simple Single Page Application.
25. Write angular js code for ngRoute module.

# Sample Practical Assignment on PHP

1. Write PHP code to check entered number is Armstrong or Not.
2. Write a menu driven program to perform following operations:
3. Check Number is Palindrome or not.
4. Check Number is Perfect or not.
5. Find face value of Entered number.
6. Check Number is Prime or not.
7. Check Number is Strong or not.
8. Write a PHP code to perform following operations: a) Sort array element b) Find Maximum and Minimum number in array c) Merge two arrays in third array. d) Swap two array elements
9. Write a program to overload the constructor.
10. Write a program which uses the static methods and static variables.
11. Write a program to implement different types of inheritance.
12. Write a program to implement interface.
13. Write a program to demonstrate Abstract classes.
14. Write a program to handle different types of exceptions.
15. Write a program which shows the use of 'final' keyword.
16. Write a program to copy the content of one file into another.
17. Write a program to merge two files into third file.
18. Design a web application to perform following task on employee table. I) Add New II) Save III) Delete IV) Update V) Move First VI) Move Last
19. Design a web application that uses cookies object.
20. Design a web application that uses session object.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

## Syllabus: Chemistry

**Name of the Course: B. Sc. Part- III (Sem. V & VI)**

**(Syllabus to be implemented from w.e.f. June 2021)**

**PAH Solapur University, Solapur**

**Faculty of Science and technology -New Choice Based Credit System (CBCS)- (w.e.f.2021-22)**

**Draft Structure for B. Sc-III Chemistry**

| Subject / Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | **B.Sc.- III Semester – V** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | **English (Business English)** | | Paper- III | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **Discipline Specific Elective (DSE)** (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II. ) | **DSE-1A-Physical Chemistry** | | Paper- IX | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE- 2 A-Inorganic Chemistry** | | Paper -X | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE- 3 A-Organic Chemistry** | | Paper- XI | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **ANY ONE from DSE-4A(I) & 4A(II)** | | Paper- XII | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE-4 A(I)-**Analytical and Industrial Physical Chemistry | | | | | | | | | |
| | **DSE-4 A(II)-**Methodology and materials of industrial importance | | | | | | | | | |
| | **(Add-on-self learning)- MOOC/SWAYAM COURSE/INTERNSHIP/INDUSTRAIL TRAINING/ Courses offered* by College** | | | -- | -- | -- | -- | -- | -- | 4.0 |
| **Grand Total** | | | | **16** | **-** | **--** | **500** | **400** | **100** | **24** |
| **Class :** | **B.Sc.- III Semester –VI** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | **English (Business English)** | | Paper IV | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **DSE** (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II. | **DSE- 1B-Physical Chemistry** | | Paper - XIII | 3.0 | - | -- | 100 | 80 | 20 | 4.0 |
| | **DSE- 2B-Inorganic Chemistry** | | Paper- XIV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE- 3B-Organic Chemistry** | | Paper- XV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **ANY ONE from DSE-4B(I) & 4B(II)** | | Paper- XVI | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE 4B(I)-** Analytical and Industrial Organic Chemistry | | | | | | | | | |
| | **DSE 4B(II)-**Applied Organic Chemistry | | | | | | | | | |
| | **SEC-** | | | | | | | | | |
| **Total (Theory)** | | | | **16** | **-** | **--** | **500** | **400** | **100** | **20** |
| **DSE - Practical (Annual Exam)** | **DSE- 1 A&B** | | Practical- IX & XIII | -- | -- | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE -2 A&B** | | Practical- X&XIV | -- | -- | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE- 3 A&B** | | Practical- XI&XV | | | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE- 4 A& B** | | Practical- XII & XVI | | | 5 | 100 | 80 | 20 | 4.0 |
| **Total (Practicals)** | | | | | | **20** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | | **32** | | **20** | **1400** | **1120** | **280** | **60** |

* Add on College course List should be submitted to the University for Information

## General Structure

**Theory Examination:**

- Structure of B.Sc. course under faculty of science has total 06 semesters for 3years.
- B.Sc.-III comprises of total two semesters (Sem-V andSem-VI).
  Each semester will have Five theory papers (one compulsory English and four Chemistry papers) of 80 marks each (University external examination) and 20 marks for each paper ( Internal examination)
  The duration of each University theory paper examination will be of 2 hr. and 30 min.
  Each theory paper has 20 marks for internal examination. There will be 10 marks unit test and 10 marks home assignment
- At the end of academic year i.e. semester - VI the practical examination will be conducted. The weightageofpracticalisof280marksforUniversityexternalpracticalexaminationand 120 i.e (30*4) marks for internal practicalexamination.

**There will be Four theory papers in chemistry of 80 marks for each semester. Their titles and marks distribution are as under (Excluding English).**

**B Sc –III Sem-V**

DSE-1A-Physical Chemistry
DSE- 2 A-Inorganic Chemistry
DSE- 3 A-Organic Chemistry
DSE 4 A(I)- Analytical and Industrial Physical Chemistry **OR** DSE-4 A(II)- Methodology and materials of industrial importance

**B Sc- III Sem-VI**

DSE- 1B-Physical Chemistry
DSE- 2 B-Inorganic Chemistry
DSE- 3 B-Organic Chemistry
DSE 4B(I)- Analytical and Industrial Organic Chemistry **OR**DSE-4B(II) Applied Organic Chemistry

## Practical Course

**Practical Examination will be held at the end of the year.**

**A) Distribution of marks :**

- **Continuous Internal Assessment forchemistry**:

1) Practical paper has 20*4=80 marks for internalexamination.
2) Practical paper has 320 marks for external university practicalexamination.
   There will be three practicals, one from each Physical, Inorganic and Organic practical work.
3) The mark distribution of 320 marks for external university practical examination is as follows.

Q. 1 Physical Chemistryexperiment : 105 marks
Q. 2 InorganicChemistryexperiment : 110marks
Q. 3 OrganicChemistryexperiment : 105 marks

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Total marks: 320 marks

**Duration of practical examination is three days, six and half hours per day**
**All answer sheets should be collected at the end of examination.**

## Practical Marks Distribution

- **Physical Chemistry experiment: 105 marks**

a) **Instrumental 40**
b) **Non-instrumental** 45
c) **Journal 10**
d) **Oral : 10**

- **Inorganic Chemistry experiment: 110marks**

a) **Gravimetric analysis : 40**
b) **Volumetric analysis 30**
c) **Preparation 20**
d) **Journal 10**
e) **Oral 10**

- **Organic Chemistry experiment: 105 marks**

a) **Organic Mixture Separation and analysis: 40**

b) **Volumetric analysis : 35**

**OR**

b) **Preparation 35**
c) **Derivative 10**
d) **Journal 10**
e) **Oral 10**

## Theory

**N. B.**

i.)Figuresshowninbracketindicatesthetotalnumberofcontacthoursrequiredforthe respectivetopics

ii) The question paper should cover the entire syllabus. Marks allotted should be in proportion to the number of contact hours allotted to respectivetopics.

iii) All topics should be dealt with S.Iunits.

iv) Use of scientific calculator isallowed.

v) Industrial tour isprescribed.

vi) Values required for spectral problems should be provided in the questionpaper.

## SEMESTER –V

## PAPER-IX:DSE-1A

## PHYSICAL CHEMISTRY

**Total Credits:4**
**Contact hrs: 60**

**1. Introduction to Quantum Mechanics** **[10]**

1.1 Introduction
1.2 Failures of classical mechanics, origin of quantum mechanics
1.3 Black body radiation, Stefan-Boltzmann law
1.4 Planck's quantum theory of black body radiation distribution
1.5 Photoelectric effect, explanation on the basis of quantum theory
1.6 Compton effect
1.7 De-Broglie hypothesis
1.8 Heisenberg's uncertainty principle (statement explanation)
1.9 Schrodinger wave equation- (Derivation not expected)
1.10 Physical significance of wave function $\psi$ and $\psi^2$

**2. Phase Equilibria.** **[10]**

2.1 Introduction
2.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in theequation.
2.3 Phase diagram, true and metastableequilibria.
2.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism.
2.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisationof lead (ii) Formation of compound with congruent melting point ($FeCl_3$ - $H_2O$)

**3. Electromotive force.** **[25]**

**(Convention : Reduction potentials to be used)**

3.1 Introduction
3.2Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms ofactivities.
3.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emfequationfor,
i) Metal - metal ion electrode. ii ) Amalgamelectrode.
iii) Metal - insoluble salt electrode. iv) Gas -electrode.
v) Oxidation - Reductionelectrode.
3.4 i) Reversible and Irreversiblecells.
ii) Chemical cells withouttransference.
iii) Concentrationcells
a. Electrode concentrationcell
I) Reversible tocation
II) Reversible toanion
b. Electrolyte concentration cells withouttransference
3.5 Equilibrium constant from cell emf, determination of the thermodynamic parameters such as $\Delta G$, $\Delta H$ and$\Delta S$.
3.6 Applications of emf measurements:
i) Determination of pH of solution using Hydrogenelectrode.
ii) Solubility and solubility product of sparingly soluble salts (based on concentrationcell).
3.7 Numericalproblems.

**4. Photochemistry.** **[15]**

4.1 Introduction

4.2 Difference between thermal and photochemicalprocesses.

4.3 Laws of photochemistry :Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark – Einsteinlaw.

4.4 Quantum yield, Reasons for high quantum yield (e.g. $H_2$ - $Cl_2$) and low quantum yield. ( e.g. Decomposition of HI andHBr).

4.5 Photosensitized reactions - Dissociation of $H_2$,Photosynthesis.

4.6 Photodimerisationofanthracene.

4.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence andphosphorescence.

4.8 Chemiluminescence.

4.9 Numericalproblems.

***Reference Books:***


1. Physical Chemistry by G. M. Barrow, International student Edition, Mc GrawHill.
2. University General Chemistry by C.N.R. Rao,Macmillan.
3. Physical Chemistry by, R. A. Alberty, Wiley EasternLtd.
4. The Elements of Physical Chemistry by P. W. Atkins,Oxford.
5. Principles of Physical Chemistry by S. H. Maron, C. H. Prutton, 4thEdition.
6. Fundamentals of Photochemistry by K.K.Rohatgi-Mukerjee.
7. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
8. Text Book of Physical Chemistry by S. Glasstone, Macmillan IndiaLtd.
9. Elements of Physical Chemistry by D. Lewis and S. Glassture(Macmillan).
10. Principles of Physical Chemistry by Maron and Lando(Amerind).
11. An Introduction to Electrochemistry by S.Glasstone.
12. Physical Chemistry by W. J.Moore.
13. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).
14. Quantum Chemistry: R. K. Prasad
15. Quantum Chemistry: D. A. MacQuerrey


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## PAPER –X:DSE-2A
## INORGANIC CHEMISTRY

**Total Credits: 04**
**Contact hrs: 60**

**1. Metal Ligand Bonding in TransitionMetalComplexes : [18]**

A) **Crystal Field Theory(CFT).**

1.A.1) Introduction - What is CFT?

1.A.2) Basic concept ofCFT.

1.A.3) Formation of complexes with Crystal field splitting of 'd'orbitals

i. Shapes of d orbitals and their electron densityregion

ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): [CoF6] $^{3-}$, $[Co(NH_3)_6]^{3+}$.

iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g.$[CoCl_4]^{2-}$

iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co\ (CN)_4]^{2-}$

1.A.4. Jahn–Tellardistortion.

1.A.5. Factors affecting the Crystal - fieldsplitting.

1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only.

1.A.7. Applications and limitations ofCFT.

**B) Molecular Orbital Theory(MOT).**

1.B.1. Introduction.

1.B.2. Basicconcept

1.B.3. Symmetry classes of atomicorbitals

1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedralcomplex.

1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$ , $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$,$[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$

1.B.6. Applications and limitations ofMOT.

1.B.7. Comparison between CFT andMOT.

**2. NuclearChemistry: [14]**

2.1. Nuclear reaction and energetics of nuclearreactions.

2.2. Classification of nuclear reactions and Types of nuclearreactions:

i) Artificialtransmutation.

ii) Artificialradioactivity.

iii) Projectile capturereaction.

iv) Projectile capture - particle emissionreaction.

v) Nuclearfission.

vi) Nuclearfusion.

2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb.

2.4. Applications of radioisotopes astracers.

i) Chemical investigation -Esterification.

ii) Structural determination - Phosphoruspentachloride.

iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood.

iv) Age determination - Dating by $^{14}C$.

**3. BioinorganicChemistry: [10]**

3.1. Essential and trace elements in biologicalprocess.

i) Essential elements a) Macro / major elements b) Micro/trace/minor elements

ii) Non-essentialelements

3.2. Metalloporphyrins with special reference to haemoglobin andmyoglobin.

i) Structure of Haemoglobin(Hb)

ii) Structure of Myoglobin(Mb)

iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs totissues

iv) Function of Haemoglobin as Carry back $CO_2$tolungs

v) Co-operativity

vi) Oxygen binding curve

vii) Difference between Haemoglobin (Hb) and Myoglobin(Mb)

3.3. Role of alkali and alkaline earth metal ions with special reference to $Na^+$ , $K^+$ and$Ca^{2+.}$

i) Role of $Na^+$and$K^+$

ii) Role of $Ca^{2+}$.

**4. Catalysis [10]**

4.1. Introduction

4.2. Classification of catalytic reactions : Homogeneous &Heterogeneous

4.3. Types of catalysis

4.4. Characteristics of catalyticreactions

4.5. Mechanism of catalysis:

i) Intermediate compoundtheory

ii) Adsorptiontheory.

4.6. Industrial Applications ofCatalysis.

**5. Fertilizers [08]**

5.1. Nutrient Functions in plant growth:

Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency.

5.2. Definition and qualities of an idealfertilizers:

5.3. Classification or types offertilizers:

5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammoniumphosphate.

5.5. Mixed fertilizers, Compound or complexfertilizers.

5.6. Pollution caused byfertilizers:

**Reference Books:**


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D.Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H.LangFord,Oxford University Press, 2ndEdition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper andRow.
4. Basic Inorganic Chemistry : Cotton andWilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton andWilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wileypublication.
7. Fundamental concepts of Inorganic Chemistry by E. S.Gilreath.
8. Structural principles in inorganic compounds. W. E.Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S.Manku.
11. Theoretical Inorganic Chemistry by Day andSelbine.
12. Co-ordination compounds S F AKettle.
13. Modern Aspects of Inorganic Chemistry. E.Sharpe.
14. New guide to Modern Valence Theory by G. I.Brown.
15. Essentials of Nuclear Chemistry by H. J.Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. NewDelhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman -Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. PitampurDelhi.
19. Text book of Inorganic Chemistry by K. N. UpadhyayaVikas Publishing House – NewDelhi.
20. Progress in inorganic polymer by LaportandLeigh.
21. Co-ordination compounds by BaseloandPearson.
22. Advancedinorganicchemistry,Vol.IandIISatyaprakash,G.D.Tuli,S.K.Basuand Madan (SChand)
23. Selected Topics in inorganic chemistry by W U Malic, G. D. Tuli, R. D. Madan. (S.Chand)
24. Industial chemistry part I and II by A. K.De
25. Industrial Chemistry, By – B K Sharma, Goel Publishing House 16th Edition: Topic No 26, Page No. 762 to 808

## Paper – XI: DSE-3A
## Organic Chemistry

**Total Credits:** 4
**Contact hrs:** 60

**1 SpectroscopicMethods.** **30**

**[10]**

**1.1. Infrared Spectroscopy**

1.1.1 Introduction.
1.1.2 Principle of IRspectroscopy.
1.1.3 Double beam IR spectrophotometer- Schematicdiagram.
1.1.4 Fundamental modes ofvibrations.
1.1.5 Types ofvibrations.
1.1.6 Hooke'slaw.
1.1.7 Factors affecting values of vibrationalfrequencies.
1.1.8 Conditions for absorption of radiation and selectionrule.
1.1.9 Fundamental group regions of IRspectrum.
1.1.10 Functional group region, Finger print region, Aromaticregion.
1.1.11 Characteristic absorption of various functionalgroups.
1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups, spectral problems based onIR.

**1.2 NMRSpectroscopy** **[12]**

1.2.1 Introduction.
1.2.2. Proton magnetic resonance ($^1$H) spectroscopy (PMR).
1.2.3 Principles of PMRspectroscopy.
1.2.4 Magnetic and non-magneticnuclei.
1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance.
1.2.6 NMR - Instrument. Schematic diagram.
1.2.7. Shielding and deshieldingeffect.
1.2.8. Chemical shift, measurement of chemical shift by delta scale and tauscale.
1.2.9. TMS as reference. Advantages ofTMS.
1.2.10. Peak area(integration).
1.2.11. Spin - spin splitting (n + 1rule).
1.2.12. Definition of coupling constant (J value) of first ordercoupling.
1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone, benzaldehyde, propanoic acid and benzoicacid.
1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to begiven).

**1.3 Mass spectroscopy** **[08]**

1.3.1 Introduction.
1.3.2 Theory of massspectroscopy
1.3.3 Mass spectrometer - schematicdiagram
1.3.4 Formation of ions byionization
1.3.5 Types of ions withexamples.
1.3.6. Applications of massspectroscopy.
i) Determination of molecularweight.
ii) Determination of molecularformula.

**2. Stereochemistry** **[10]**

2.1 Introduction.
2.2 Baeyer's straintheory.
2.3 Theory of strainlessrings.
2.4 Conformation and stability of cyclohexane and monosubstitutedcyclohexanes– methylcyclohexane.
2.5 Locking of conformation in t-butylcyclohexane.
2.6 Stereoselective and stereospecific reactions:
i) Stereochemistry of addition of halogens to alkenes:syn and anti-addition. Example - Addition of bromine to 2-butene. (mechanism notexpected)
ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol (Example of $SN^2$reaction)

**3. Name reactions** **[10]**

Mechanism and applications of following reactions:
3.1 Stobbecondensation.
3.2 Oppenaueroxidation.
3.3 MeerweinPonndorfVerleyreduction.
3.4 Reformatskyreaction.
3.5 Wagner –MeerweinRearrangement.
3.6 Hofmann rearrangement reaction.
3.7 Wittigreaction.
3.8 Relatedproblems.

**4. Organic synthesisviaEnolates** **[10]**

4.1 Introduction - Reactive methylenegroup.
4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocycliccompound.
4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic acid, α- β- unsaturated acid, α-amino acid and heterocycliccompound.

***Reference Books:***


1) Organic Chemistry: D. J. Cram and G. S. Hammond, McGraw Hill book Company, New York.
2) Organic Chemistry: I. L. Finar, The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry: Peter Sykes, Longman Green and Co. Ltd. London 6thEdition.
4) Organic Chemistry: R. T. Morrison and R. N. Boyd, Prentice Hall of India Private Limited, New Delhi. 6thEdition.
5) Text book of organic Chemistry: L. N. Ferguson, N. D. Van Nostrand Company Indian Edition, Affiliated East west press private Ltd. NewDelhi.
6) Organic Chemistry Vol. I, II and III: S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Eastern, Limited, NewDelhi.
7) A text book of organic Chemistry: K. S. Tewari, S. N. Mehrotra, N.K. VishnoiVikas Publishing House Private Ltd. NewDelhi.
8) A text book of Organic Chemistry: ArunBahl and B. S. Bahl , S.Chand and Company Ltd. 6thEdition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism: Raj K. Bansal, Wiley Easter Ltd., NewDelhi.
10) Reaction Mechanism and Reagents in Organic Chemistry: G. R. Chatwal, Himalaya Publishing House, NewDelhi.
11) Stereochemistry conformation and mechanism: P. S. Kalsi, New Age International Publishers, 4th Edition.
12) Organic Chemistry Volume I and II: I. L. Finar ELBS with Longman 6thEdition.
13) Organic Chemistry Volume I and II : William Kemp, ELBS withMc. Million 3rdEdition.
14) Advanced Organic Chemistry: Jerry March, Wiley EasternLtd.
15) Spectroscopy of Organic compounds: P. S.Kalsi.

16) Modern Methods of Organic Synthesis, W Carruthers, IaonColdhalm, Cambridge UniversityPress
17) Organic Chemistry: Fieser andFieser.
18) Principles of Organic Chemistry: English andCassidy.
19) Elementary Organic Absorption Spectroscopy: Y. R.Sharma.
20) Spectroscopy: V. M.Parikh.
21) Stereochemistry of Carbon Chemistry: Eliel.
22) Principles of Organic Chemistry: M. K.Jain.
23) Organic Chemistry by Clayden, Greeves, Warren and WothersOxford press.
24) Organic Chemistry: A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical ScienceSeries.
25) Reactions, Rearrangements and reagents: S.N.Sanyl, BharatiBhawan publishers and DistributorsPatna.

## PAPER-XII : DSE-4A(I)
## ANALYTICAL AND INDUSTRIAL PHYSICAL CHEMISTRY

**Total Credits: 4**
**Contact hrs: 60**

**1. Colorimetry.** **[10]**

1.1 Introduction

1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer'slaw.

1.3Classification of methods of color measurement or comparison, Photoelectric photometer method - single cell photo-electriccolorimeter.

**2. Potentiometry** **[12]**

2.1 Introduction.

2.2 Detail study of calomel, quinhydrone and glass electrodes and their use in determination of pH.

2.3 Basic circuit diagram of direct readingpotentiometer

2.4 Potentiometric titrations : Classical and analytical methods for locating endpoints,

i) Acid - Basetitrations.

ii) Redox - titrations.

iii) Precipitationtitrations.

2.5 Advantages of potentiometrictitrations.

**3 Electroplating** **[14]**

3.1 Introduction.

3.2 Electrolysis, Faraday's laws, Cathode currentefficiency.

3.3 Basic principles of electroplating, cleaning ofarticles.

3.4 Electroplating of Nickel andChromium.

3.5 Anodising.

**4 Flame photometry** **[12]**

4.1 Generalprinciples.

4.2 Instrumentation : Block diagram,
Burners: Total consumption burner, premix or laminar-flow burner and Lundergraph burner,
Mirrors,
Slits,
Monochromators,
Filters
Detectors.

4.3 Applications in qualitative and quantitativeanalysis.

4.4 Limitations of flamephotometry.

**5. Conductometry:** **[12]**

5.1 Basic circuit of D.C. Wheatstone bridge, Measurement of conductance by Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molarconductance.

5.2 Conductometric acid-basetitrations

i. Strong acid against strongbase
ii. Strong acid against weak base
iii. Weak acid against strongbase.
iv. Weak acid against weakbase.

5.3 Advantages of conductometrictitrations

***Reference Books :***


1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rdEdition).
2. Instrumental methods of Chemical analysis by Willard, Merit andDean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (HimalayaPublication).
4. Principles of electroplating and eletroforming by Blum andHogaboom, Mac Graw - Hill Book Co. 3rdEdn.
5. Vogel's text book of Quantitative Inorganic Analysis by Basssett and Denny etc. ELBS and Longman 4thEdition.
6. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
7. Text Book of Physical Chemistry by S. Glasstone, McMillan IndiaLtd.
8. Elements of Physical Chemistry by D. Lewis and S. Glasstone(McMillan).
9. Principles of Physical Chemistry by Maron and Lando(Amerind).
10. An Introduction to Electrochemistry by S.Glasstone.
11. Physical Chemistry by W. J.Moore.
12. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).


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# PAPER-XII : DSE-4A(II)
# METHODOLOGY AND MATERIALS OF INDUSTRIAL IMPORTANCE

**Total Credits: 4**
**Contact hrs: 60**

**1. DataAnalysis (15 Lectures)**

1.1 The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design ofexperiments.
1.2 Analysis and Presentation of Data: Descriptive statistics. Choosing and using statisticaltests.
1.3 Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curvefitting, fitting of linear equations, simple linear cases, weighted linear case, analysis ofresiduals,
1.4 General polynomial fitting, linearizing transformations, exponential function fit, 'r' and its abuse.
1.5 Basic aspects of multiple linear regressionanalysis.

**2. Chemical Safety and Ethical Handlingof Chemicals: (15 Lectures)**

2.1 Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratoryventilation.
2.2 Safe storage and use of hazardouschemicals,
2.3 Procedure for working with substances that pose hazards, flammable or explosivehazards,
2.4 Procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratorychemicals,
2.5 Procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewersystem.
2.6 Incineration and transportation of hazardouschemicals.

**3. Nanomaterials: (15 Lectures)**

3.1 Overview of nanostructures and nanomaterials:classification.
3.2 Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensionalcontrol.
3.3 Carbon nanotubes and inorganicnanowires.
3.4 Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisicalnanomaterials,
3.5 Bionanocomposites.

**4. Compositematerials: (15 Lectures)**

4.1 Introduction,limitationsofconventionalengineeringmaterials,roleofmatrixincomposites,
4.2 Classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforcedcomposites.
4.3 Environmental effects oncomposites.
4.4 Applications ofcomposites.

**Reference Books**

1) Practical skills in chemistry, Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) 2nd Ed. Prentice-Hall, Harlow.
2) Data analysis for chemistry, Hibbert, D. B. & Gooding, J. J. (2006) Oxford University Press.
3) Errors of observation and their treatment, Topping, J. (1984).Fourth Ed., Chapman Hall, London.
4) Quantitative chemical analysis, Harris, D. C. 6th Ed., Freeman (2007) Chapters 3-5.
5) How to use Excel in analytical chemistry and in general scientific data Analysis, Levie, R. de, Cambridge Univ. Press (2001) 487 pages.
6) Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
7) Inorganic Solids: An introduction to concepts in solid-state structural Chemistry, Adam, D.M. John Wiley & Sons, 1974.
8) Introduction to Nanotechnology, Poole, C.P. & Owens, F.J. John Wiley & Sons, 2003.

## SEMESTER-VI

## PAPER-XIII:DSE-IB

## PHYSICALCHEMISTRY

**Total Credits: 4**
**Contact hrs:60**

**1. Spectroscopy.** **[15]**

1.1 Introduction
1.2 Electromagnetic radiation.
1.3 Electromagnetic spectrum, Energy leveldiagram.
1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzmann distribution), determination of bond length; isotope effect. Interaction of radiation with rotatingmolecule.
1.5 Vibrational spectra of diatomic molecules: Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant,zero point energy. The Anharmonic oscillator, overtones and hot band. Interaction of radiation with vibrating molecules.
1.6 Raman spectroscopy: Introduction, Rayleigh scattering. Raman Scattering, classicaltheory of Raman effect and quantum theories of Raman effect. Polarization of light and the Raman effect. Mutual exclusion principle.
1.7 Numerical problems.

**2. Solutions.** **[15]**

2.1 Introduction
2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids.
2.3 Vapour pressure and boiling point diagrams of miscibleliquids.
Type I : Systems with intermediate total vapour pressure.
(i.e. System in which B.P. increases regularly - Zeotropic)
Type II : Systems with a maximum in the total vapour pressure.
(i.e. System with a B.P. minimum - Azeotropic)
Type III :Systems with a minimum in the total vapour pressure.
(i.e. System with a B.P. Maximum - Azeotropic)
Distillation of miscible liquid pairs.
2.4 Solubility of partially miscible liquids.
(i) Maximum solution temperature type : Phenol - watersystem.
(ii) Minimum solution temperature type :Triethyl amine - watersystem.
(iii) Maximum and minimum solution temperature type : Nicotine - watersystem.

**3. Thermodynamics.** **[15]**

3.1 Introduction
3.2 Free energy : Gibbs function (G) and Helmholtz function (A), Criteria for thermodynamic equilibrium andspontaneity.
3.3 Relation between G and H : Gibbs Helmholtzequation.
3.4 Phase equilibria :Clapeyron – Clausius equation.
3.5 Thermodynamic derivation of law of mass action, van't Hoff isotherm and isochore.
3.6 Fugacity and activityconcepts.
3.7 Numericalproblems.

**4. Chemical Kinetics** **[15]**

4.1 Introduction, simultaneous reactions such as opposing reactions, side reactions, consecutive reactions and chain reactions. [Derivations of rate Equations for these reactions are notexpected.]

4.2 Effect of temperature on the rate ofreaction.
1. Temperaturecoefficient
2. Arrheniusequation
3. Energy ofactivation

4.3 Theories of reaction rate:
1. Collision theoryand
2. Transition statetheory

4.4 Third order reaction with equal concentration of all reactants, their characteristics and examples
4.5 Numericalproblems.

***Reference Books :***


1. Principles of Physical Chemistry by Maron and Pruton 4th edition.
2. Principles of Physical Chemistry by Puri, Sharma, Pathania, ShobhanlalNaginchand and Company,Jalandar.
3. Text Book of Physical Chemistry by S. Glasstone, McMillan IndiaLtd.
4. Elements of Physical Chemistry by D. Lewis and S. Glasstone(McMillan).
5. Principles of Physical Chemistry by Maron and Lando(Amerind).
6. Thermodynamics for chemists by SGlasstone.
7. Physical Chemistry by W. J.Moore.
8. Essentials of Physical Chemistry, Bahl and Tuli (S.Chand).
9. Basic Chemical Thermodynamics by V V Rao(McMillan)
10. An introduction to chemical thermodynamics by R. R. Mishra and R. P.Rastogi.
11. Fundamentals of molecular spectroscopy by C. N. Banwell and McCash- Tata McGrawHill


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## PAPER-XIV: DSE-2B
## INORGANIC CHEMISTRY

**Total Credits:04**
**Contact hrs:60**

### 1) Study ofF-blockElements [15]

**1.1** Lanthanides:-

I) Introduction
II) Electronicconfiguration
III) Occurrence
IV) Separation ofLanthanides
i) Bulk separationmethods
ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail)

**1.2** Actinides:-

I) Introduction
II) Electronicconfiguration
III) General Methods of preparation–
a. Neutron-capture followed byβ-decay
b. Accelerated projectile bombardmentmethod
c. Heavy-ion bombardment method

### 2) MetalsandSemiconductors. [13]

**2.1** Introduction.
**2.2** Properties of metallicsolids.
**2.3** Theories of bonding inmetal.
a) Free electrontheory.
b) Molecular orbital theory (Bandtheory).
**2.4** Classification of solids as conductor, insulators and semiconductors on the basis of bandtheory.
**2.5** Semiconductors:
a) Types of semiconductors - intrinsic and extrinsicsemiconductors.
b) Applications ofsemiconductors.
**2.6** Superconductors:
a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_7$-x
b) Applications ofsuperconductors.

### 3) StructuralChemistry. [12]

**3.1** Structural study of followingcompounds.
i) Diborane.
ii) Borazine.
iii) Xenon compounds → $XeF_2$, $XeF_6$, $XeO_4$ (w.r.t. VBTonly.)
**3.2** Structural study of Oxides of Sulphur and Phosphorous:
i) Oxides of Sulphur : $SO_2$ and$SO_3$
ii) Oxides of Phosphorous : $P_4O_6$ and$P_4O_{10}$

### 4) CorrosionandPassivity. [12]

**4.1 Corrosion:-**

I. Introduction
II. Types ofcorrosion
III. Electrochemical theory ofcorrosion
IV. Factors affecting thecorrosion
i) Position of metal in emfseries.
ii) Purity ofmetal.
iii) Effect ofmoisture.
iv) Effect ofoxygen.
v) Hydrogen overvoltage.
V. Methods of protection of metals fromcorrosion.

**4.2 Passivity:-**

I. Definition.
II. Types ofpassivity.
III. Oxide filmtheory.
IV. Application ofpassivity.

## 5. OrganometallicChemistry. [08]

5.1 Introduction -Definition,
5.2 Nomenclature of organometalliccompounds.
5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be andAl.
5.4 Mononuclear carbonyl and nature of bonding in simple metalcarbonyls.

## *Reference Books :*


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D.Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford, Oxford University Press, 2ndEdition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper andRow.
4. Basic Inorganic Chemistry : Cotton andWilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton andWilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wileypublication.
7. Fundamental concepts of Inorganic Chemistry by E. S.Gilreath.
8. Structural principles in inorganic compounds. W. E.Addison.
9. T. B. of Inorganic analysis - A. I.Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S.Manku.
11. Theoretical Inorganic Chemistry by Day andSelbine.
12. Co-ordination compounds S F AKettle.
13. Modern Aspects of Inorganic Chemistry. E.Sharpe.
14. New guide to Modern Valence Theory by G. I.Brown.
15. Essentials of Nuclear Chemistry by H. J.Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman -Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. PitampurDelhi.
19. Text book of Inorganic Chemistry by K. N. UpadhyayaVikas Publishing House – NewDelhi.
20. Progress in inorganic polymer by LaportandLeigh.
21. Co-ordination compounds by BaseloandPearson.
22. Organometallic Chemistry by P. L.Pauson.
23. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan
24. Selected Topics in inorganic chemistry by W U Malik, G. D. Tuli, R. D.Madan. (S.Chand)
25. Industrial chemistry part I and II by A. K.De
26. Industrial chemistry by B. K.Sharma

## Paper - XV:DSE-3B
## Organic Chemistry

**Total Credits:**4
**Contact hrs:**60

**1 Heterocycliccompounds** **[13]**

1.1 Introduction andclassification
1.2 Pyrrole
1.2.1 Methods ofsynthesis
i) Fromacetylene
ii) Fromfuran
iii) Fromsuccinamide
1.2.2 Physicalproperties
1.2.3 Reactivity ofpyrrole
i) Basic character
ii) Acidiccharacter
iii) Electrophilic substitution with generalmechanism
1.2.4 Chemicalreactions
i) Reduction
ii) Oxidation
iii) Nitration
iv) Sulphonation
v) Halogenation
vi) Friedel Craft'sreaction
vii) Couplingreaction

1.3 Pyridine
1.3.1 Methods ofsynthesis
i) From acetylene and hydrogencyanide
ii) Frompiperidine
1.3.2 Physicalproperties
1.3.3 Chemicalreactions
i) Basic character
ii) Electrophilic substitution reactions : Nitration, Sulphonation andBromination
iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyllithium.
1.4 Quinoline
1.4.1 Synthesis - Skraup's synthesis
1.4.2 Physicalproperties.
1.4.3 Reactions ofquinoline
i) Electrophilic substitution reactions - Nitration andsulphonation.
ii) Nucleophilic substitution reactions – Reactions with sodamide, alkyl lithium and aryllithium
iii) Reduction

**2. Carbohydrates** **[12]**

2.1 Introduction
2.2 Classification andnomenclature
2.3 Monosaccharide D-glucose - Open chainstructure
2.4 Chain lengthening of Aldoses –Kilianisynthesis
2.5 Chain shortening of Aldoses - Weerman'sreaction
2.6 Interconversion of glucose andfructose
2.7 Configuration of D-glucose fromD-arabinose
2.8 Objections against open chain structure ofD-glucose.
2.9 Mutarotation withmechanism.
2.10 Ring structure of D-glucose - Determination of size of ringby
i) Methylationmethod.
2.11 Disaccharides - Introduction, sucrose and lactose - sources, structural formulae anduses.
2.12 Polysaccharides–Introduction, Starch and Cellulose - sources, structural formulae and uses

**3. VitaminsandHormones** **[08]**

3.1 General idea of vitamins, structure and synthesis of vitaminA
3.2 General idea of hormones, structure and synthesis of Adrenaline andThyroxin

**4. Pharmaceuticals** **[11]**

4.1 Introduction
4.2 Qualities of idealdrug
4.3 Methods of classification of drugs - Classification based on the therapeuticalaction
4.4 Brief idea of pencillin-G (constitution, synthesis notexpected)
4.5 Synthesis and uses of the following drugs:

i) Antimalerials -Paludrin
ii) Antituberculars - Isoniazide andEthambutol
iii) C. N. S. drugs -Phenobarbitone
iv) Antidiabetics -Tolbutamide
v) Anti-inflammatory drugs -Ibuprofen
vi) Antibiotics -Chloromycetin
vii)Anticancer drugs : Chlorambucil(Leukeran)

**5 Syntheticdyes** **[09]**

5.1 Introduction, Qualities of gooddye
5.2. Classification based on constitution and methods of applications
5.3 Witt's theory - Colour andconstitution
5.4 Synthesis of Orange IV, Malechite green,phenolphthalein

**6 Agrochemicals** **[07]**

6.1 General idea of agrochemicals includingpyrethroides.
6.2 Synthesis and uses of the following agrochemicals:

i) Indole-3-acetic acid.
ii) Monocrotophos
iii) Methoxychlor
iv) Ethophan
v) Carbaryl
vi) Baygon

***Reference Books :***


1) Organic Chemistry - Cram D. J. and Hammond G.S. McGraw Hill book Company NewYork.
2) Organic Chemistry - Finar I. L. The English Language Book Society,London.
3) A Guide Book to mechanism in Organic Chemistry - Peter Sykes LongmanGreen and Co. Ltd. London 6thEdition.
4) Organic Chemistry - R. T. Morrison and R. N. Boyd Prentice Hall of India private limited New Delhi. 6thEdition.
5) Text book of organic Chemistry - Ferguson L. N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. NewDelhi.
6) Organic Chemistry Vol. I, II and III - S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Estern, Limited, NewDelhi.
7) A text book of organic Chemistry - K. S. Tewari, S. N. Mehrotra, N. K. VishnoiVikas Publishing House Private Ltd. NewDelhi.
8) A text book of Organic Chemistry - ArunBahl and B. S. Bahl S. Chand and Company Ltd. 6thEdition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism - Raj K. Bansal Wiley Easter Ltd. NewDelhi.
10) Reaction Mechanism and reagents in Organic Chemistry - G. R. Chatwal Himalaya Publishing House NewDelhi.
11) Organic Chemistry Volume I and II - I. L. Finar ELBS with Longman 6thEdition.
12) Organic Chemistry Volume I and II - William Kemp ELBS with Macmillion 3rdEdition.
13) Advanced Organic Chemistry - Jerry March Wiley EasternLtd.

14) Organic Chemistry - FieserandFieser.
15) Principles of Organic Chemistry - English andCassidy.
16) Chemicals for crop improvement and pest management - Green, HartlyandWest.
17) Chemistry of pesticides - K. H. Buchel (T.W.).
18) Medical Chemistry -Burger.
19) Principles of Organic Chemistry - M. K.Jain.
20) Organic Chemistry by Clayden, Greeves, Warren and WothersOxfordpress.
21) Organic Chemistry - A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical ScienceSeries.
22) Reactions, Rearrangements and reagents - S.N. Sanyl, BharatiBhawan publishers and DistributorsPatna.
23) Synthetic Organic Chemistry-KamleshBansal.
24) Synthetic Organic Chemistry-GurudeepChatwal.
25) Chemistry of Insecticides – U.S. SreeRamulu.
26) Medicinal Chemistry- AshitoshKar.

## Paper-XVI : DSE-4B(I)
## Analytical and Industrial Organic Chemistry

**Total Credits:**4
**Contact hrs:**60

**1. Soaps and Detergents** **[11]**

1.1 Soaps
i) Rawmaterials
ii) Types ofsoaps
iii) Manufacture of soap – Hotprocess
iv) Cleansing action ofsoaps
1.2 Detergents
i) Rawmaterials
ii) Types of detergents - Cationic, anionic, amphoteric, neutraldetergents
iii) Preparation of teepol andderiphat
1.3 Comparison between soaps anddetergents

**2. Synthetic Polymers** **[11]**

2.1 Introduction
2.2 Classification:
i) According to origin, composition, method of preparation and general physicalproperties
ii) Classification based uponstructure
2.3 Process of addition polymerisation - free radical polymerisation of alkenes andDienes
2.4 Ionicpolymerisation
2.5 Ziegler – Nattapolymerisation
2.6 Methods of preparation and uses of:
i) Polystyrene ii) PVC iii) Phenol formaldehyde resin iv)Polyurethane
2.7 Natural rubber : General idea andvulcanisation
2.8 Synthetic rubbers : Synthesis and uses of:
i) Polychloroprene ii) Buna rubber - Buna N and BunaS

**3. Sugar andAlcoholIndustry** **[11]**

3.1 Manufacture of raw canesugar
3.2 Refining of rawsugar
3.3 Whitesugar
3.4 By-products of sugarindustry
3.4.1 Manufacture of ethyl alcohol frommolasses
3.4.2 Rectified spirit, Denatured spirit absolute alcohol and poweralcohol
3.4.3 By-products of alcoholindustry

**4. SyntheticReagents** **[09]**

4.1 Sodium borohydride: Use in reduction of aldehydes andketones
4.2Lithium aluminium hydride: Use in reduction of aldehydes, ketones,acids, amides andesters
4.3 Osmium tetroxide **:** Hydroxylation ofalkenes
4.4 1,3-dithiane : Umpolung concept, reactions with alkyl halide and acylhalide
4.5 Selenium dioxide : Oxidation of carbonyl compounds and allylicoxidation

**5. Green Chemistry** **[06]**

5.1 Introduction - Twelve principles of greenchemistry
5.2 PTC: Introduction, Role in organic reactionscatalysis
5.3 Biocatalytic reactions - Hydroxylation and oxidation usingenzymes
5.4 Introduction to microwave assistedreactions
5.5 Ionic liquids – Introduction and examples of ionicliquids

**6 Chromatography** **[12]**

6.1 Introduction
6.2 Generalprinciples
6.3 Classification
6.4 Study of following chromatographic techniques with reference to principle, methodology andapplications
i) Paperchromatography
ii) Columnchromatography
iii) Thin layerchromatography
iv) Gas chromatography

***Reference) Books:***


1. Basic Concepts of Analytical Chemistry - S. M. Khopkar, Wiley Eastern Ltd.Bombay.
2. Industrial Chemistry - R. K. Das, Asia Publishing,Mumbai.
3. Text Book of Quantitative Organic Analysis - A. I. Vogel, Pearson Edn.Delhi.
4. Quantitative Organic Chemistry - A. I. Vogel, Pearson Edn.Delhi.
5. Hand Book of Organic Analysis - H. T. Clarke, Arnold Heinemann Pub.Delhi.
6. Advanced Organic Chemistry - B. S. Bahl and ArunBahl, S. Chand Comp.Delhi.
7. Riegel's Handbook of Industrial Chemistry - J. A. Kent, Van. Nostrard,Londan.
8. Chemical Process Industries - Shreve and Brinic - Ostin, Magraw Hill, NewYork.
9. Analytical Chemistry- Walton.
10. Biotechnology and Applied Microbiology - Alani andMoo-Young.
11. Immobilize Biocatalysis– JoyWleser.
12. Introduction to Polymer Chemistry - Raymond B.Seymour.
13.Polymer Science - V. R. Gowarikar, N. V. Viswanathan and JayadevSreedhar Willey EasternLimited.
14. Advances in Green Chemistry: Chemical synthesis using MW-irradiation by R. S.Varma.
15. GreenChemistry:EnvironmentFriendlyalternatives-RashmiSanghiandM. M. Srivastava (Eds) (c) 2003 Narosa Publishing House, New Delhi, India.
16. Reactions, rearrangements and reagents : S. N.Sanyal
17. Organic reaction mechanism : V. K. Ahluwalia and K.R.KParashar
18. Environment friendly synthesis using ionic liquids: JairtonDupont, Toshiyuki Itoh and Sanjay V. Malhotra (CRCPress)

## Paper-XVI :DSE-4B(II)
## Applied Organic Chemistry

**Total Credits: 4**
**Contact hrs: 60**

### 1. Theory of binarymixtureanalysis 08

1.1 Types of organic compounds, nature and types of binarymixtures.
1.2 Reactions of acid, base, phenol and neutrals with sodium bicarbonate, sodium hydroxide and hydrochloricacid
1.3 Principle of binary mixtureseparation.
1.4 Determination of type of themixture
1.5 Separation of mixture- using aqueous medium andether.

### 2. GreenChemistry 06

2.1 Introduction
2.2 Twelve principles of greenchemistry
2.3 Zeolites as greencatalysts
2.4 Ultrasound assistedreactions
2.5 Reactions in ionicliquids
2.6 Solvent freereactions

### 3. Chemistryofcosmetics 15

3.1 Ageneralstudyincludingpreparationandusesof-Hairdye,hairspray,shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, cold creams, vanishing creams and shavingcreams

### 4. Chemistryofperfumes 15

4.1 Ageneralstudyincludingpreparationandusesof-antiperspirants,andartificial flavours
4.2 Essentialoilsandtheirimportanceincosmeticindustrywithreferencetoeugenol, geraniol, sandalwood oil, eucalyptus oil, rose oil, 2-phenyl ethyl alcohol, jasmone, civetone andmuscone

### 5. Fermentation 07

5.1 Aerobic and anaerobicfermentation
5.2 Production of antibiotics-streptomycin
5.3 Production of vitamins-Vit.B12

### 6. TextileChemistry 09

6.1 Introduction, classification offibers
6.2 Sizing: object of sizing, sizing ingredients and theirfunctions
6.3 General idea of processes : singeing, desizing,scouring
6.4 Bleaching: Brief study of the outline of the process of bleachingcotton and syntheticmaterial.
6.5 Dyeing : Study of dyeing of cellulosic material and synthetic fibers with dyes like direct, vat, reactive and dispersedyes.

**Reference Books**


1. Industrial chemistry : B. K. Sharma(Goel Publishing House,Meerut)
2. Engineering Chemistry: P. C. Jain and M. Jain(Dhanpatrai and sons,Delhi)
3. Practical Organic Chemistry: A. I. Vogel
4. Advances in green chemistry-Chemical synthesis using Microwave irradiation: R. S.Verma
5. A book of textile chemistry: A. J.Hall
6. Bleaching and Dyeing : Dr. V.Shenai
7. Sizing : D. B.Ajgaonkar
8. Chemical process industries : Shreve and Brinik (OstinMcGrawHill Publication, NewYork)
9. Medicinal and Pharmaceutical Chemistry: Hakishan, V. K. Kapoor (VallabhPrakashanPimpura NewDelhi)
10. Industrial Chemistry, Vol. I:E. Stocchi (Ellis Horwood Ltd,UK)

# PRACTICALS

N.B. i. Use of Electronic balance with 0.001g accuracy ismandatory.
ii. Use of Scientific calculator is allowed.

## Physical Chemistry

**I) Non instrumental Experiments( Any Five) :**

1. To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by the distributionmethod.
2. To determine the partition coefficient of $CH_3COOH$ between $H_2O$ and$CCl_4$.
3. Critical SolutionTemperature.
To determine the CST for phenol – water system.
4. The study of energy of activation of first order reaction i.e. hydrolysis ofmethyl acetate in presence of 0.5 NHCl.
5. The study of energy of activation of first order reaction i.e. hydrolysis ofmethyl acetate in presence of 0.5 $NH_2SO_4$.
6. The study of energyof activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Equalconcentrations).
7. The study of energyof activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Unequalconcentrations).
8. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of thereaction.
9. To study the effect of addition of electrolyte (KCl) on the reaction between $K_2S_2O_8$ and KI (Equalconcentrations).

**II. Instrumentalexperiments**

**A. Potentiometry (AnyThree).**

1. Titration of strong acid with strongalkali.
2. Preparation of buffer solution and determination of their pH (Any five buffer solutions), - Theoretical calculation of pH values by using Henderson'sequation.
3. Determination of standard electrode potential of $Zn/Zn^{++}$ , $Cu/Cu^{++}$ , $Ag/Ag^{+}$ (Anytwo).
4. Determination of solubility and solubility product ofAgCl.
5. Titrationofferrousammoniumsulphateusing$K_2Cr_2O_7$solutionandtocalculateredox potential of $Fe^{++}$ , $Fe^{+++}$system

**B. Conductometry( any three).**

1. Titration of weak acid with strongalkali.
2. Titration of a mixture of weak acid and strong acid with strongalkali.
3. Tostudytheeffectofsubstituentondissociationconstantofweakacidwithrespecttoacetic acid and monochloroacetic acid (cell constant to begiven).
4. To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometricmethod.

**C. Refractometry.**

1. To determine the percentage composition of unknown mixture by (i)graphical method and (ii) by composition law (Densities of pure liquids A & B begiven).
2. To determine the molar refractivityof methyl acetate, ethyl acetate, n-hexane and carbon tetrachloride and calculate the refraction equivalents of C, H and Clatoms.

**D. Colorimetry (AnyTwo).**

1. To verify Lambert - Beer's law using $CuSO_4$solution.
2. To estimate $Fe^{+++}$ ions by thiocynatemethod.
3. To estimate $Fe^{+++}$ ions using salicylic acid by colorimetrictitration.

**E. pH - metry (AnyOne).**

1. To determine the dissociation constant of monobasic acid (Aceticacid).
2. To determine the dissociation constant of dibasic acid (Malonicacid).

**Reference Books :**


1. Findlay's Practical Physical Chemistry(Longman)
2. Advanced Practical Physical Chemistry by J. B. Yadav, Goelpublishinghouse.
3. Practical Physical Chemistry by B. D. Khosla, V. C. Garg (R. Chand andCo.)
4. Systematic experimental Physical Chemistry by Rajbhoj, Chandekar (AnjaliPublicaiton)
5. Practical Physical Chemistry :Nandkumari, Kothari andLavande.
6. Practical Physical Chemistry by Gurtu (S.Chand).

## Inorganic Chemistry

**I. Gravimetric Estimations(G).**

**N. B. : Any two experiments from G1 to G3 and any two experiments from G4 to G7**

G1. Gravimetric estimation of iron as ferric oxide from the given solution containing ferrous ammonium sulphate, copper sulphate and free sulphuric acid.

G2. Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, ferrous ammonium sulphate and free sulphuric acid.

G3. Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride, ferric chloride and free hydrochloric acid.

G4. Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate, copper sulphate and free sulphuric acid.

G5. Gravimetric estimation of barium as barium chromate from the given solution containing barium chloride, ferric chloride and free hydrochloride acid.

G6. Gravimetric estimation of Aluminium as Aluminiumoxinate i.e.
tris (8-hydroxyquinolinato) aluminate (III) from a given solution containing potash alum, copper sulphate and free sulphuric acid.

G7. Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) from the given solution containing nickel sulphate, ferrous ammonium sulphate and free sulphuric acid.

[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm and asked to dilute to 100 cm (or the stock solution should be given in the range of 20 to 30 cm and asked to dilute to 250 cm). Use 50 cm of this diluted solution for estimation.]

**II. Inorganic Preparations (P): (anyfive).**

N. B.–1. Calculations of % yield isexpected.

2. After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in termsof:
   a) Name of central metalion
   b) Oxidation number of metalion
   c) Nature ofligand
   d) Nature ofbonding
   e) Type ofhybridization
   f) Inner orbital or outer orbitalcomplex
   g) Geometry of the complex withstructure
   h) Magnetic property of thecompound
   i) Color of thecompound
   j) Nature: Crystalline /Amorphous

P1. Preparation of potassium trioxalatoferrate(III)

P2. Preparation of potassium trioxalatoaluminate (III)

P3. Preparation of tris(ethylenediamine)nickel (II) thiosulphate

P4. Preparation of sodium hexanitrocobaltate (III)

P5. Preparation of ammonium diamminetetrathiocynatochromate(III) (Reineck's salt)

P6. Preparation of nickel ferrite.

P7. Preparation of hexamminenickel (II) chloride

P8. Preparation of tris(thiourea)cuprous(I) sulphate

**III) Titrimetric Estimations:**

**A) Percentage Purity** (anythree)

V1. Determination of percentage purity of ferrous ammonium sulpahte.

V2. Determination of percentage purity of tetramminecopper (II) sulphate.

V3. Determination of percentage purity of potassium trioxalatoaluminate(III).

V4. Determination of percentage purity of potassium trioxalatoferrate (III).

**B) Analysis of Commercial Sample** (any three).

V5. Determination of percentage of magnesium in the given sample of talcum powder.

V6. Determination of amount of aluminium in the given solution of potash alum.

V7. Determination of titrable acidity in the given sample of milk or lassi.

V8. Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.

V9. Determination of percentage purity of boric acid using supplied sodium hydroxide (Standard succinic or oxalic acid solution to be prepared for standardization of the given sodium hydroxide solution.)

**C) Ion exchange method**

V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).

V11. Determination of amount of magnesium and zinc in the given solution containing ($Mg^{++}$ and $Zn^{++}$) using anion exchange resin and standard solution of EDTA.

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***Reference Books:***

1. A text book of quantitative Inorganic Analysis - A. I.Vogel.
2. Text book of Quantitative Inorganic Analysis - Kolthoff andSandell.
3. Experimental Inorganic Chemistry - Palmer W.G.
4. Advanced Practical Inorganic Chemistry - Adams andRaynor.
5. Handbook of Preparation Inorganic Chemistry. Vol. 1 and 11 -Brauer.
6. Manual in Dairy Chemistry - I.C.A.R. Sub-Committee on DairyEducation.
7. Chemical methods for environmental analysis - R. Ramesh and M.Anbu.

# Organic Chemistry

**I) Qualitativeanalysis**

Separation of binary mixture and Identification of its components. 5g of mixture is to be given for separation. At least **08 mixtures** are to be separated.

Nature 1) Solid - Solid: 4 mixtures

2) Solid - Liquid : 2mixtures

3) Liquid - Liquid : 2mixtures

1) Solid - Solid Mixtures:

One mixture from each of the following types should be given:

i) Acid+Phenol ii) Acid +Base

iii) Acid+Neutral iv) Phenol +Base

v) Phenol+Neutral vi) Base +Neutral

2) Solid - LiquidMixtures

One mixture of type Neutral + Neutral and One mixture of type Acid + Neutral should be given.

3) Liquid - LiquidMixtures

One mixture of type Neutral + Neutral and One mixture of type Base + Neutral should be given.

Following compounds should be used for preparation of mixtures:

Acids: Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, Aspirin, Oxalic acid.

Phenols: α-naphthol, β-naphthol

Bases: o -nitroaniline, m-nitroaniline, p-nitroaniline, aniline, o-toluidine and N, N-dimethyl aniline.

Neutrals: Naphthalene, acetanilide, m-dinitrobenzene, chloroform, carbon tetrachloride, acetone, nitrobenzene, ethyl acetate, ethyl benzoate, acetophenone, bromobenzene, urea and thiourea.

**II) Quantitative analysis:**

**III) Organic estimations**:**(Any four)**

1) Estimation ofsucrose

2) Estimation of nitrogroup

3) Saponification value ofoil.

4) Estimation of formaldehyde from given formalinsolution.

5) Estimation of acid and ester present in the given mixture of acid andester.

6) Estimation of acid and amide from the mixture of acid andamide.

**IV) Organic Preparations** : **(anyfour)**

N.B.: a) Calculation of percentage practicalyield.

b) Recrystallisation of crude product and its meltingpoint.

c) The purity of the product may be confirmed byTLC.

1) Preparation of m-nitroaniline fromm-dinitrobenzene.

2) Preparation of aspirin from salicylicacid.

3) Preparation of nerolin fromβ-naphthol.

4) Preparation of p-iodonitrobenzene fromp-nitroaniline.

5) Preparation of benzene azo - β -naphthol.

6) Preparation of benzoic acid from cinnamicacid.

**IV Preparation of Derivatives:**

N.B.:During practical course, name of the organic compound should not to be given.

1) Bromo derivative of aniline and cinnamicacid.

2) Nitro derivative of salicylic acid andnitrobenzene.

3) Benzoyl derivative of β-naphthol andaniline

4) Picrate derivative of anthracene andβ-naphthol.

5) Oxalate and nitro derivatives ofurea.

6) Anhydride derivative of phthalicacid.

7) Oxime derivatives of Ketones : Acetone andacetophenone.

8) 2: 4 DNP ofacetophenone.

***Reference Books:***

1. Practical Organic Chemistry by A. I.Vogel.

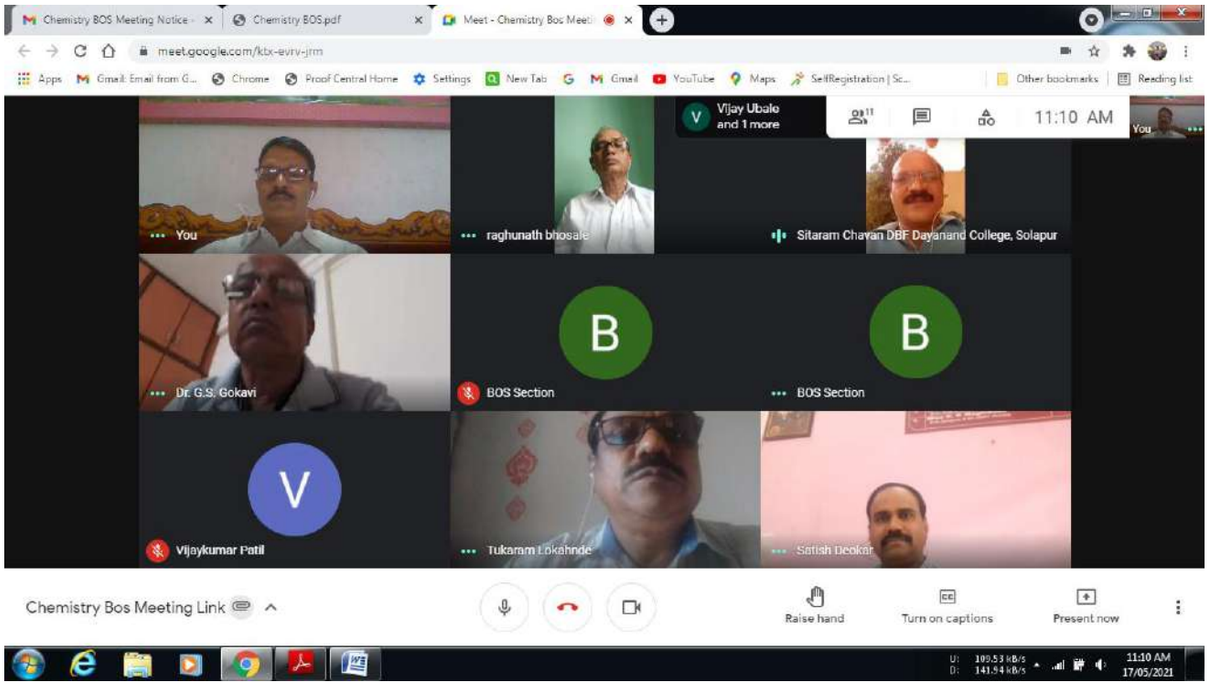
2. Hand book of Organic qualitative analysis by H. T.Clarke.

3. A laboratory Hand Book of Organic qualitative analysis and separation by V. S. Kulkarni. DastaneRamchandra&Co.

4. PracticalOrganicChemistrybyF.G.MannandB.C.Saunders. Low-pricedTextBook. ELBS.Longman.

5. Experiments in General Chemistryby C. N. R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.

6. Advanced Practical Organic Chemistry by N. K. Vishnoi. Vikas Publishing House Private Limited.
7. ComprehensivePracticalOrganicChemistryQualitativeAnalysisbyV.K.Ahluwalia, SunitaDhingra. University Press. Distributor - Orient LongmanLtd.
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V.K. Ahluwalia, Renu Agarwal. University Press. Distributor-Orient LongmannLtd.
9. PracticalChemistry-Physical-Inorganic-OrganicandViva-vocebyBalwantRaiSatija. Allied Publishers PrivateLimited.30
10. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House,Mumbai.
11. College Practical Chemistry by Patel, Jakali, Mohandas, IsraneyTurakhia. Himalaya Publishing House,Mumbai.
12. Practice of thin layer chromatography by Joseph C. Touchstone, Murrell F. Dobbins. A Wiley - Interscience Publication John-Wiley &Sons.

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# Punyashlok Ahilyadevi Holkar Solapur University, Solapur


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

## Syllabus: Microbiology

**Name of the Course: B. Sc. Part- III (Sem. V & VI)**

**(Syllabus to be implemented from w.e.f. June 2021)**

**P.A.H.Solapur University, Solapur , Faculty of Science**
**Choice Based Credit System (CBCS)**
**B.Sc.-III Microbiology**
**( 2021-2022 : W.e.f. June 2021)**

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**Introduction:**

The Curriculum development plays a very vital role in the development of quality of education. The education system should be such that students will be able to compete locally, regionally, nationally as well as globally. The present situation demands developing "learner-centric approach while redesigning of curriculum. There is also need to allow the flexibility in education system. The choice based credit system (CBCS) allows students to choose inter-disciplinary, intra-disciplinary courses, skill oriented papers and thus offers more flexibility for student. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. In view of this,PAH Solapur University, Solapur has implemented Choice Based Credit System of Evaluation at Undergraduate level. While designing the syllabi of microbiology for undergraduate course for semester V and VI, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template. This will help to bring a match across all the Indian universities.

Microbiology deals with the study of microorganisms. This branch of life science has immensely grown up widening its horizons and opening new frontiers of knowledge. The scope of microbiology as a subject is immense due to its ability to control all critical points of many fields like medical, dairy, pharmaceutical, industrial, clinical, research, water industry, agriculture, nanotechnology, etc. A career in microbiology is lucrative option. There is demand of trained microbiologists in a vast range of industries and institutes like research and development laboratories of government and private hospitals, research organizations, pharmaceutical, food, beverage and chemical industries. To cater the needs, discipline specific papers on industrial,agricultural,environmental,medicalmicrobiology,microbial biochemistry,virology,immunology have been included in the curriculum for semester V and VI. At the same time, the framework is so designed as to maintain standards of microbiology degree and the learning outcomes.

**Learning Outcomes based approach to Curriculum Planning:**

The Learning Outcomes-based Curriculum Framework (LOCF) for the B.Sc. (Honours) degree in Microbiology is designed to suit the need of the hour, in keeping with the emergence of new areas of microbiology. The framework is architected to allow for flexibility in programme design and course content development, while at the same time maintaining a basic uniformity in structure in comparison with other universities across the country. The programme is designed to build a strong microbiology knowledge base in the student and furthermore, acquaints the students with the applied aspects of this fascinating discipline as well. The student is thus equipped to pursue higher studies in an institution of her/his choice, and to apply the skills learnt in the programme to solving practical societal problems. The programme offers an elective course to the student for skill enhancement courses that prepares the student for an eventual job in academia or industry.

**Graduate Attributes in Microbiology:**

Some of the characteristic attributes of an Honors graduate in Microbiology include:

- **Disciplinary Knowledge acquisition**: gathers in-depth knowledge of basic and applied areas of microbiology.

- **Core microbiology laboratory skills**: understands various methods of safe handling, culturing and storage of microorganisms in the laboratory.
- **Interdisciplinary approach**: becomes aware of the role of microbiology in interdisciplinary research as well as in daily life.
- **Environmental literacy**: develops a basic understanding of the microbiological principles that have environmental implications, and gains an awareness of regulatory requirements and their compliance in biotechnology and microbiological research.
- **Thinking ability**:inculcates independent thinking and apply knowledge acquired.
- **Spirit of Team work**: Reveals the importance of interacting with and working alongside people from diverse backgrounds.
- **Global perspective**: becomes acquainted with standard international practices and emerging technologies used to study microbes.
- **Skills for Communication**: acquires oral as well as written skills through oral presentations of ongoing developments in the field and compiling of information in brief in written format.
- **Ethical awareness:develops** attitude of conducting their work with honesty
- **Self-motivation**: develops planning, organization and time management skills.
- **Digitally literatracy**: : acquires Skills of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

**Outline of Choice Based Credit System:**

1. **Core Course***:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. **Elective Course***:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.
Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. **Ability Enhancement Courses (AEC***):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• **Credit**: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

**PAH Solapur University, Solapur**
**Faculty of Science-New**
**Choice Based Credit System (CBCS)- (w.e.f.2021-22)**
**Draft Structure for B. Sc-III**

| **Subject/ Core Course** | **Name and Type of the Paper** | | **No. of papers/ Practical** | **Hrs/week** | | | **Total Marks Per Paper** | **UA** | **CA** | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Type** | **Name** | | **L** | **T** | **P** | | | | |
| **Class :** | **B.Sc.- III Semester – V** | | | | | | | | | |
| **Ability Enhancement Course(AECC)** | | **English (Business English)** | Paper- III | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **Discipline Specific Elective (DSE)** (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc II. | | **DSE-1A-** Virology | Paper- IX | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | **DSE- 2 A-** Agricultural Microbiology | Paper -X | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | **DSE- 3 A-** Immunology | Paper- XI | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | **DSE 4 A-**: Industrial Microbiology | Paper- XII | 3 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | **(Add-on-self learning)-MOOC/SWAYAM COURSE/INTERNSHIP** | | -- | -- | -- | -- | -- | -- | 2.0 |
| **Grand Total** | | | | **16.0** | -- | -- | **500** | **400** | **110** | **22** |
| **Class :** | **B.Sc.- III Semester –VI** | | | | | | | | | |
| Ability Enhancement Course(AECC) | | **English (Business English)** | Paper IV | 4.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| **DSE** (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II. | | **DSE- 1B-** Microbial Genetics | Paper -XIII | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | | **DSE- 2B-** Microbial Biochemistry | Paper- XIV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **DSE- 3B-** Clinical Microbiology | Paper- XV | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **DSE 4B-** Environmental Microbiology | Paper- XVI | 3.0 | -- | -- | 100 | 80 | 20 | 4.0 |
| | **SEC-** | | | | | | | | |
| **Total (Theory)** | | | **16.0** | -- | -- | **500** | **400** | **100** | **20** |
| **DSE - Practical (Annual Exam)** | **DSE- 1 A&B** | Practical- IX & XIII | -- | -- | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE -2 A&B** | Practical- X&XIV | -- | -- | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE- 3 A&B** | Practical- XI&XV | | | 5 | 100 | 80 | 20 | 4.0 |
| | **DSE- 4 A& B** | Practical- XII & XVI | | | 5 | 100 | 80 | 20 | 4.0 |
| **Total (Practicals)** | | | | | **20** | **400** | **320** | **80** | **16** |
| **Grand Total** | | | **32.0** | | **20** | **1400** | **1120** | **280** | **58** |

**Summary of the Structure of B.Sc.Programme as per CBCS pattern**

| **Class** | **Semester** | **Marks-Theory** | **Credits-Theory** | **Marks-Practical** | **Credits-Practicals** | **Total – credits** |
|---|---|---|---|---|---|---|
| **B.Sc.-I** | I | 500 | 20 | -- | -- | 20 |
| | II | 550 | 20 | 400 | 16 | 36 |
| **B.Sc.-II** | III | 350 | 14 | -- | -- | 14 |
| | IV | 350 | 14 | 300 | 12 | 26 |
| **B.Sc.-III** | V | 500 | 22 | -- | -- | 22 |
| | VI | 500 | 20 | 400 | 16 | 36 |
| **Total** | | 2750 | 110 | 1100 | 44 | 154 |

**B.Sc.Programme :**
**Total Marks** : Theory + Practical's = 2750 +1100 =3950
**Credits** : Theory + Practical's = 110 + 44 = 154
**Numbers of Papers** Theory: Ability Enhancement Course(AECC) : 05
Theory: Discipline Specific Elective Paper (DSE) : 08
Theory: DSC : 12
Skill Enhancement Courses /Add on : 01
**Total** : Theory Papers : 31
: Practical Papers : 11

**Abbreviations :**
L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper

SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

**PAH SOLAPUR UNIVERSITY, SOLAPUR**
**Faculty of Science**
**Choice Based Credit System (CBCS)**
**(W.e.f. 2021-22)**

- **Title of the Course**: B.Sc. Part-III (Honors)
- **Subject:** Microbiology

- **Introduction**: This course provides a broad overview of Microbiology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Microbiology knowledge. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

- **Objectives of the course**: The objectives of B. Sc. Microbiology course are:

1) To impart knowledge with respect to the subject and its practicable applicability.
2) To enhance understanding of basic and advanced concepts in microbiology.
3) To develop the awareness of various emerging areas of Microbiology.
4) To train students for further studies helping in their bright career in the subject
5) To expose the students to different processes used in industries and in research field
6) To develop their ability to apply the knowledge of microbiology in day to day life.
7) To prepare the students to accept the challenges in life sciences.
8) To make students skillful to work in various industries, research labs and health sector.

**Course outcome and Advantages**: After completing the course students will be familiarized the with necessary laboratory techniques and tools of microbiology and provide an exposure in research, analytical and presentational skills. Microbiology has tremendous job potential. The successful students will be able well trained to get various microbiology related job. .

- Medium of Instruction: English
- Syllabus Structure:
- The University follows semester system.
- An academic year shall consist of two semesters.
- B.Sc. Part-Ill Mcrobiology shall consist of two semesters: Semester V and Semester VI

In semester V: there will be Four DSC papers having paper IX to XII of 100 marks each. There will a Compulsory paper on "Ability Enhancement Compulsory Course (AECC )" on English and one self learning compulsory course of any one from -MOOC/SWAYAM COURSE/INTERNSHIP

In Semester VI: there will be four DSC papers having paper XIII to paperXVI of 100 marks each. There will a Compulsory paper on "Ability Enhancement Compulsory Course (AECC )" on English

The scheme of evaluation of performance of candidates shall be based on University Assessment (UA) as well as College Internal Assessment (CA) as given below.

For B.Sc.Part-III Microbiology SemV& VI the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

- Practical course examination is of 100 marks shall be conducted at the end of semester II. The practical examination of 400 marks shall also consist of 320 marks for University practical assessment and 80 marks for college internal assessment (CA).

• **Scheme of Evaluation**: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks..

**Semester – V:** Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper IX to paper XII)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper IX to paper XII)
c) Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English
d) One Add-on - self learning courseMOOC/SWAYAM COURSE/INTERNSHIP

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

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**Semester – VI**: Theory: (100 marks): Comprising DSE-

a) University Examination (UA) (80 marks): No. of theory papers: 4 (paper XIII to paper XVI)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 4 (paper XIII to paper XVI)

Internal test- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
**Practical Examination**: (400 marks)
University Examination (320 marks): Number of practicals : 04

Practical-I: Based on Papers- IX & XIII (80 UA + 20 CA)
Practical-II: Based on Papers- X & XIV :(80 UA + 20 CA)
Practical-III: Based on papers -XI& XV :(80 UA + 20 CA)
Practical-IV: Based on papers -XII& XVI :(80 UA + 20 CA)
**Internal Continuous Assessment**: Total 80
(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 320 marks (Practical I to IV for Four separate days) will be conducted at the end of semester VI

**Passing Standard**:
The student has to secure a minimum of 4.0 grade points (Grade C) in each paper.

A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade. Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same stipulated marks of external examination and his/her performance shall be scaled to 100 marks.

• **ATKT:**

passed in all papers except 6 (six) papers combined together of semester III and IV of B.Sc. Part-II Mcrobiology examination and clearly passed in B.Sc. Part-I-Mcrobiology shall be permitted to enter upon the course of Semester V of B.Sc. III Microbiology.

| PAH SOLAPUR UNIVERSITY, SOLAPUR<br>Faculty of Science and technology<br>New CBCS Structure for B.Sc – III Microbioology Theory - | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Semester V** | | | | | | | | |
| **Paper No.** | **Title of Paper** | **Hrs/Week** | | | **Paper Marks** | **UA** | **CA** | **Credits** |
| | | L | T | P | | | | |
| Ability Enhancement Course(AECC) | **English (Business English)** | 4 | - | - | 100 | 80 | 20 | 4 |
| DSE-IX | **DSE- 1A-** Virology | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-X | **DSE- 2A-** Agricultural Microbiology | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-XI | **DSE- 3A-** Immunology | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-XII | **DSE 4A-** Industrial Microbiology | 3 | - | - | 100 | 80 | 20 | 4 |
| SEC- | **Add-on-self learning - MOOC/SWAYAM COURSE/INTERNSHIP** | -- | -- | -- | -- | -- | -- | 2.0 |
| Total | | 16 | - | - | 500 | 400 | 100 | 22 |

| **Semester –VI** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Paper No.** | **Title of Paper** | **Hrs/Week** | | | **Paper Marks** | **UA** | **CA** | **Credits** |
| | | L | T | P | | | | |
| Ability Enhancement Course(AECC) | **English (Business English)** | 4 | - | - | 100 | 80 | 20 | 4 |
| DSE- -XIII | **DSE- 1B-** Microbial Genetics | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-XIV | **DSE- 2B-** Environmental Microbiology | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-XV | **DSE- 3B-** Clinical microbiology Microbiology | 3 | - | - | 100 | 80 | 20 | 4 |
| DSE-A | **DSE 4B-** Microbial Biochemistry | 3 | - | - | 100 | 80 | 20 | 4 |
| SEC- | | | | | | | | |
| Total | | 16 | | | 500 | 400 | 100 | 20 |

| Practical No. | Paper No. based on | Title of Paper | Hrs/Week | | | Paper Marks | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | | | | |
| **I** | Papers - IX & XIII | **DSE-1A-** Virology **AND** **DSE- 1B-** Microbial Genetics | - | - | 5 | 100 | 80 | 20 | 4 |
| **II** | Papers - X&XIV | **DSE- 2 A -** Agricultural Microbiology AND **DSE- 2B -** Environmental Microbiology | - | - | 5 | 100 | 80 | 20 | 4 |
| **III** | Papers - XI&XV | **DSE- 3A-** Immunology **AND** **DSE- 3 B -** Clinical Microbiology | - | - | 5 | 100 | 80 | 20 | 4 |
| **IV** | Papers - XII & XVI | **DSE 4 A-** : Industrial Microbiology **AND** **DSE 4B-** Microbial Biochemistry | - | - | 5 | 100 | 80 | 20 | 4 |
| | **Total** | | **-** | **-** | **20** | **400** | **320** | **80** | **16** |

**Abbreviations:**

L: Lectures
T: Tutorials
P: Practicals
UA: University Assessment by End Semester Examination
CA: College Assessment by Internal Continuous Examination
UA: University Assessment: - University Theory paper shall be of 70 marks
CA: College Assessment: - The internal examination for theory and practical course

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**Theory Syllabus**
**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 1- A: Paper MIC IX: Virology

**Unit I Introduction and Classification of Viruses (11)**

A. General properties and structure of virus
B. Viroids and Prions
C. Viral classification on the basis of LHT system and as per international committee

**Unit II Reproduction of bacterial viruses (11)**

A. $T_4$ Bacteriophage - Lytic cycle
B. Temperate phages and lysogeny of λ phages

**Unit III Animal Viruses (14)**

A. Reproduction of Animal viruses: Adeno viruses and Influenza viruses
B. Oncogenic Viruses- i) Types of Oncogenic viruses, DNA and RNA viruses, (ii) Types of cancer, Characteristics of cancerous cells, (iii) Hypotheses of Cancer: Somatic mutation, Viral gene and Defective immunity

**Unit IV Plant Viruses (12)**

A. Viral plant Diseases – Tobacco mosaic virus[TMV],Cauliflower Mosiac virus[ CaMV]
B. Prevention and Control of Plant Viral Diseases

**Unit V Techniques in Virology (12)**

A. Isolation, cultivation,Purification and Enumeration of viruses
**B.** One step growth experimen**t**

**References:**


1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Genetics of bacteria and their viruses – William Hays
4. Virology – Biswas
5. Virology – Luria
6. Microbiology - Prescott, Harley and Klein's, Willey Sherwood

Woolverton,McGraw – Hill International Edition, (2008).

7. Plant viruses- by Mathews

8. Microbiology by Davis
9. Plant diseases by Singh

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**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 2 – A: Paper MIC - X: Agricultural Microbiology

### Unit I- Introduction toSoilMicrobiology (11)

A. Introduction to soil– Definition of soil, Soil formation, types, structure andproperties
B. Soil as anecosystem, rhizosphere and phyllosphere
C. Soil microorganisms, types and theirrolein soil fertility, humus.
D. Interactions in soil.

### Unit II- Role of microorganisms inelementalcycle (11)

A. Carboncycle
B. Nitrogencycle
C. Sulphurcycle
D. Phosphorouscycle

### Unit III- Composting and Biodegradation (14)

A. Compost production with reference to organic waste, types of microorganisms, and factors affecting - aeration, C:N:P ratio, moisture content, temperature, pH, and period ofcomposting.
1. Greenmanure
2. Farm yardmanure
3. Towncompost
4. Vermicompost
B. Biodegradation of Cellulose, hemicelluloses, Lignin, Pectin, and Pesticides

### Unit IV-Plantpathology (12)

A. Common symptoms produced by plantpathogens
B. Modes of transmission of Plant diseases: Oily spots on pomegranate – *Xanthomonasoxynopodis*, whip smut of sugarcane, soft rot ofpotato
C. Control measures of plantdiseases

### Unit V Applications of BiotechnologyinAgriculture (12)

A. Biofertilisers (Azo and Rhizo and PSB) production andapplications.
*B.* Bioinsecticides – *Bacillus thuriengenesis* and *Trichodermaviridae, Other examples*
C. Genetically Modified Crops with examples
D. Viral pesticides:Concepts & applications

### References

1. Soil Microbiology – Subbarao,N.S.

2. Microbial dynamics and diversity – DesyStaley

3. Biology of Microorganisms – Brock, Parker, Madigen, 9thedition
4. Agricultural Microbiology- Bagyaraj andGhosh
5. Plant Diseases- SinghR.S.
6. Soil Microbiology –Alexander.
7. Industrial Microbiology – PatelA.H.
8. Textbook of Biotechnology – R.C.Dubey,

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**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 3 – A: Paper MIC - XI: Immunology

**Unit I. Immune system and Adaptive Immunity** (16)

**A] Immune system**

a]structure &function of lymphoid organs:

1]Primary and organs - Thymus, bone marrow,

2] Secondary lymphoid organs-- spleen , lymph node and Mucosa associated lymphoid tissue(MALT)

b]cells of immune system &their role

i]. Classification of cells of immune system-Lymphoid and myeloid cells

ii]. Structure and functions of Lymphoid cells- T cells and T cell subsets, NK cells, B cells and dendritic cells

iii]. Structure and functions of myeloid cells – Granulocytes, Monocytes and macrophages

**B]Adaptive Immunity**

a) Humoral (antibody) mediated response –Cells involved and mechanism
b) Cell mediated – cells involved, mechanism (endogenous and exogenous pathways); cytokines and their role
c) Primary and secondary immune response
d) **Monoclonal antibodies** – i) Production (hybridoma technology) ii) Applications of Monoclonal antibodies in Diagnosis, Research and Treatment

**Unit II.Major Histocompatibility complex** (12)

A. Organization of MHC genes in man, Classes of MHC molecules – structure and their role,
B. HLA typing
C. Types of grafts and their rejection.

**Unit III.Complement system** **(06)**

A. Components of complement and their properties,
B. Activation of complement –classical and alternate pathway
C. Biological effects of complement

**Unit IV Immunological disorders** **(16)**

**A. Hypersensitivity** – Classification - based on

1. Time:Immediate and delayed typehypersensitivity
2. Mechanism of Pathogenesis
   - **a) Type I :** Anaphylaxis, Atopy
   - **b) Type II :** Autohaemolytic anemia
   - **c) Type III :** Arthus reaction, Serum sickness
   - **d) Type IV:** contact dermatitis, Allergy of infection

**B. Autoimmunity** :a. Mechanism of Autoimmunity

b. Types of Autoimmune diseases-

a) Hemocytolytic b) Organ Specific(Graves disease, Myasthenia gravis,pernicious anemia)

c) Non organ specific (S.L.E., R.A.)

**Unit V Immunohaematology** **(10)**

A. ABO blood group system
B. Rh blood group system
C. Blood transfusion reaction and its complications

**References**


1. Essentials of Immunology Roitt Evan, Brostoff J. Male D. (1993) 6th Edition.
2. Immunology - Kuby J. (1996) - W.H. Freeman and Co.
3. Immunology – Fudenberg
4. Medical Microbiology - Davis and Dulbecco
5. Medical laboratory technology – RamnaikSood
6. Diagnostic Microbiology – Bailey's and Scotts
7. Immunology – a problem approach by Wood, Hood and Weison
8. Medical Bacteriology – Dey and Dey
9. Handbook of Immunology- G.P. Talwar (1983) Vikas Publishing Pvt. Ltd 10.Textbooks of medical microbiology-Anant Narayan
11. Immunolgy& Serology-Carpenter.

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**Theory Syllabus**
**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSC – 4A : Paper MIC – XII : Industrial Microbiology

**Unit I Food Microbiology** **(11)**

A. Food as a substrate for microorganisms
B. Food Spoilage (Meat and Poultry, Fruits and Vegetables)& food borne diseases-food infection (Salmonella) & food poisoning (Clostridium)
C. Principle and methods of food preservation
D. Food Fermentations – i) Idli ii) Bread

**Unit II Dairy Microbiology** **(11)**

A]Spoilage of milk
B]Fermented dairy products: i) Cheese ii) Yogurt

**Unit III Industrial production of** **(12)**

A. Streptomycin
B. Lysine
C. rDNA products – Insulin
D. Vitamin B12

**Unit IV Production of alcoholic beverages** **(12)**

A. Grape wine – Definition, types, production of White table wine and Red table wine
B. Post fermentation spoilage of wines: Microbial and non microbial spoilage of wines
C. Beer – Definition, types, production of Lager beer and Ales Beer.

**Unit V Downstream processing and quality control:** **(14)**

**A) Downstream processing:**
Filtration, Cross flow filtration, Flocculation, Whole broth processing Solvent extraction, Concentration, Centrifugation, Crystallization, Distillation, Adsorption elution, Precipitation and Chromatography
**B) Quality control in fermentation industry:** Test for sterility, pyrogenicity, allergy, Carcinogenicity, toxicity for Pharmaceutical and health care and food products

**References**


1. Principles of fermentation technology – Whitkar and Stanbury
2. Pharmaceutical Microbiology – Huggo
3. Biochemistry – Fox and Nelson
4. Industrial Microbiology – Prescott and Dunn
5. Microbial technology – Peppler
6. Advances in Biotechnology – S.W. Jogdand.
7. Textbook of Biotechnology – R.C. Dubey,
8. Biotechnology – B.D. Singh

9. Industrial Microbiology – Casida
10. Industrial Microbiology by A.H. Patel.
11. Food Microbiology: an Introduction by Adam and Dick
12. Food Microbiology by Frazier

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**Theory Syllabus**
**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

**DSE – 1B – B:PaperMIC - XIII: Microbial Genetics**

**Unit I: Basic concepts of microbial genetics** (11)

A) Structural organization of *Escherichia coli* chromosome, folded fiber model
B) Replication of DNA: Enzymes involved and mechanisms of replication
C) Transcription: RNA polymerase enzyme, process and post transcriptional modification
D) Operon concept – Lac Operon

**Unit II: Effect of mutation in bacteria** (12)

A) Effect of mutation on translation
B) Effect of mutation on phenotypes
C) Time course of phenotypic expression
D) Selection, detection and Isolation of mutants
E) Genetic Complementation – Cis – Trans Test

**Unit III: Genetic engineering and Protein engineering** (14)

A) Introduction, Tools and Techniques of Genetic engineering
B) Applications of Genetic engineering
C) Protein Engineering – concept and applications

**Unit IV : Techniques in molecular biology** (12)

A) Electrophoresis of DNA.
B) DNA sequencing – Sanger Dideoxy method
C) DNA finger printing- method and applications

**Unit V Bioinformatics** **(11)**

A. Introduction to Bioinformatics.
B. Introduction to major bioinformatics resources on Internet: National Centre for Biotechnology Information (NCBI), DDBJ, EMBL.
C) Protein data bank (PDB) and Nucleic acid sequence database (GenBank)
D) The Basic Local Alignment Search Tool (BLAST)

**References:**


1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Biochemistry – Lehninger
4. Molecular Biology of Gene – J.D. Watson
5. Recombinant DNA – J.D. Watson

6. Microbiology - Davis
7. Biochemistry - Purohit
8. Genetics of bacteria and their viruses – William Hays
9. http://www.ncbi.nlm.nih.gov/

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**Theory Syllabus**
**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 2 – B Paper MIC - XIV: Environmental Microbiology

### Unit I: Air microbiology and biosafety issues (16)

A]Concept and definition of biosaftey,objectives of biosafety,NIH guidelines

B] Regulatory framework of biosaftey in India-

a]Recombinant DNA,Advisory committee[RDAC]

b] Institutional biosaftey committee[ISBC]

c]State biosaftey coordination committee [SBCC]

d] District level biosaftey committee[DLBC]

C]Microorganisms in air – Launching, transport and deposition of aerosols, survival of microorganisms in air
D]Significance of microorganisms in air (extramural and intramural)
EMethods to study air borne microorganisms. Sampling, qualitative and quantitative methods.
F]Bioaerosal control (ventilation, filtration, biocidal control, UV gaseous (quarantine)

### Unit II : Marine microbiology and Fresh water ecosystem (10)

A. Microorganisms in marine water, methods to study aquatic microorganisms. Characteristics of marine environment, types of organisms and their role.
B. Fresh water ecosystem : Eutrophication, Types of fresh water bodies a) Classification of lakes b) Sources c) Consequences d) Control

### Unit III Extremophiles: (8)

General characteristics of extremophiles and their role -
Acidophiles, Alkalophiles, Thermophiles, Psychrophiles, Barophiles and Osmophiles

### Unit IV Environmental impact assessment and Industrial Waste Management: (12)

A) Types of wastes, Waste water assessment and management, BOD, COD,
B. **Industrial waste treatment** : Characteristics and treatment of wastes from different industries, – paper and pulp, sugar and distillery, textile, and dairy industries,
C) Bioremediation :Lead, mercury, arsenic and radioactive substances

### Unit V Geomicrobiology and carbon sequestration (14)

**A)** Introduction, Microorganisms involved, Biochemistry of microbial leaching,

Commercial leaching – slope, heap, in situ leaching, Leaching of Iron, Copper and Uranium,

**B)** Oilrecovery: Methods – primary, secondary, and microbially enhanced oil recovery,

**C)** Concept of carbon sequestration and carbon credit

**References:**


1. Physiology and Biochemistry of Extremophiles- Charles Gerday and Nicolas Glansdorff
2. Environmental Microbiology – Maier
3. Microbial ecology – Fundamentals and applications - Atlas and Bartha
4. Microbial dynamics and diversity – Desy Staley
5. Biology of Microorganisms – Brock, Parker, Madigen, 9th edition
6. Microbiology – Prescott and Harley, 5th edition

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
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**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 3 B– Paper MIC - XV: Clinical Microbiology

**Unit I: Microbial diseases (24)**

(characters of etiological agent, , modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases)

**1.Bacterial**: 1. Pseudomonas aeruginosa 2.Mycobacterium leprae 3.Clostridium perfringens 4.Vibrio cholerae

**2.Viral:** 1. Rabies 2.AIDS 3.Swine flu 4. Ebola

**3.Fungal**:1.Dermatophycoses[Tinea],2.cryptococcosis

**4.protozoal**: 1.Malaria 2. Giardiasis

**Unit II :Biomedical Waste Management (06)**

Laboratory disposal of – Sharp devices, Smeared Slides, Cultures, Culture Media and Clinical Samples, Fomites

**Unit III mechanism of Pathogenecity – (8)**

**1.** Definition & Concept
2. Basic principles of Microbial adhesion
3. Mechanism of Bacterial invasion
4. Bacterial toxins – Types & mechanism of action
5.Mechanism of pathogenecity of viral & fungal infections

**Unit IV:Vaccinology & bioweapons (8)**

1. Basic concept

2. Types:A]traditional-live attenuated,killed,toxoids

B]New generation vaccines: subunit, Recombinant ,conjugated, DNA

3.Definition,Characteristics of bioweapons ,Advantages &disadvantages of bioweapons,Examples

**Unit-V : Chemotherapy (14)**

1. Ideal characteristics of chemotherapeutic agents
2. Mechanism of action of different chemotherapeutic agents:

A]antibiotics
i. Acting on Cell Wall: Penicillin, Bacitracin, Vancomycin,
ii. Acting on Protein Synthesis: Streptomycin, Chloramphenicol,
iii. Acting on nucleic acid synthesis: quinolenes, rifampicin
iv. Drugs Acting on folic acid synthesis: Sulphonamide, Trimethoprim,
B]antiviral agents
C]antifungal agents
D]antiprotozoal agents

3.Mechanism of antibiotic resistance
4.Tests to guide chemotherapy:diffusion and broth dilution methods

**References:**


1. Pharmaceutical Microbiology – Huggo
2. Text book of Medical Microbiology – Ananthnarayan
3. Review of Medical Microbiology – Jawetz et al
4. Microbiology – Zinsser
5. Medical Microbiology – Cruickshank
6. Medical Microbiology - Davis and Dulbecco
7. Parasitology – Chattergii
8. Medical laboratory technology – RamnaikSood
9. Diagnostic Microbiology – Bailey's and Scotts
10. Medical Bacteriology – Dey and Dey

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**Theory Syllabus**
**B.Sc. III-Microbiology (Semester-V)**
**w. e. f. June 2021**

**[Credits -4, Total Lectures-60]**

## DSE – 4– B: Paper MIC - XVI: Microbial Biochemistry

**Unit I Enzyme, Enzyme kinetics and regulation** **(16)**

A) **Enzymes**:
(i) Definition, properties, structure, specificity, mechanism of action (Lock and key model, induced fit hypothesis)
(ii) Allosteric enzymes – Definition, Two models explaining mechanism of action (Sequential and Concerted)
(iii) Ribozymes and Isozymes
iv) Factors affecting catalytic efficiency of enzymes
i) Proximity, orientation ii) Strain and distortion iii) Acid base catalysis iv) Covalentcatalysis
B) **Enzyme kinetics** – Derivation of MichaelisMenten equation, Significance of Km and Vmax
**C) Regulation of enzyme synthesis**
i) Positive control – Arabinose Operon ii) End product repression – Tryptophan Operon
iii) Catabolite repression

**Unit II Extraction, purification and assay of enzymes** **(10)**

A) Cell disruption and homogenization of membrane bound enzymes, Extraction
B) Purification of enzymes on the basis of - i) Molecular size ii) Solubility
iii) Electric charge iv) Adsorption characteristics) Biological affinity
C) Immobilization of enzymes – Methods and applications
D) Assay of enzymes (enzyme unit, enzyme activity, Specific activity)

**Unit III Assimilation of**: **(10)**

A. Carbon
B. Nitrogen – N2 and NH3 (GOGAT)
C. Sulphur

**Unit IV Bioenergetics:**

**A)** Pyruvate as key metabolite inCarbohydratemetabolism **(14)**
B) Metabolic Pathways
i) ED pathway
ii) Glyoxylate bypass
iii) Pentose Phosphate Pathway
iv) Phosphoketolase pathway
C) Bioluminescence

**Unit VBiosynthesisof:** **(10)**

A) Nucleotides- Purines and pyrimidines B) Protein C) Peptidoglycan

**References:**


1. Molecular Biology of Gene – J.D. Watson
2. Principles and techniques of Practical Biochemistry – K. Wilsons J.Walkar.
3. Analytical Chemistry – Robert B. Dilts
4. Chromatographic methods by Braithwaite and White
5. Outline of Biochemistry – Cohn and Stump
6. Biochemistry – West and Todd Russel
7. Biochemistry – Lehninger
8. Enzymes – Dixon and Web
9. Biological chemistry – Mahler and Cordes
10. Nature of Enzymology – R.L. Foster
11. Microbial technology – Peppler
12. Biochemistry – A problem approach by Wood, Hood and Weison

**PAH SOLAPUR UNIVERSITY, SOLAPUR (CBCS)**
**B.Sc. III-Microbiology**
**w. e. f. June 2021 --Practicals Syllabus**
**( Credits-4 )**

## PRACTICAL COURSE

### Practical V:

1. Isolation of DNA from bacteria by J. Marmur's method
2. Electrophoretic separation of DNA
3. Isolation of coliphages from sewage
4. One step growth curve
5. Determination of dose of U.V. by UV survival curve
6. Isolation of Lac negative mutants of *E.coli* by visual detection method.
7. Isolation of Streptomycin resistant mutants by gradient plate technique.
8. Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
9. Cultivation of Viruses in Embryonated chicken egg
10. Study of Virally infected lesions of Plant materials
11. Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites.
12. Exploring protein sequence database (PDB) and GeneBank and BLAST.

### Practical VI:

1. Isolation of **Azotobacter**from soil. (Identification up to genus level)
2. Isolation of ***Rhizobium*** from root nodules.
3. Isolation of ***Xanthomonas***from infected plant material
**4.** SPC of market **Biofertilizers.**
5. Estimation of available phosphorous from soil (Stannous chloride method)
6. Estimation of Calcium and Magnesium from soil (EDTA method)
7. Determination of organic carbon contents of soil (Walkley and Black method)
8Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test
9Determination of potability of water by MPN.
10Waste water analysis: Chemical Oxygen Demand
(COD)
11.Biological Oxygen Demand (BOD)

### Practical VII:

1. Separation and Preservation of Serum and Plasma
2. Widal test (quantitative test), RA test, Pregnancy test
3. Haematology –
   1] Estimation of Hb by Sahlis method
   2] Total blood cell count:RBC count, WBC count,
   3]differential WBC count
   4]Determination of Erythrocyte sedimentation Rate
4. Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*
5.Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% H2O2, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli,*

*Staphylococcus aureus, Bacillus*) by disc diffusion method

6.Antimicrobial susceptibility testing by disc diffusion method

7.Urine analysis :

A]Microscopic examination – pus cells, RBc, bacteria, crystals.

B] Chemical examination –

1]glucose (benedict's method,

2]protein (acetic acid),

3]bile salt (sulphur method),

4]ketone bodies (Rothera's test)

**Practical VIII:**

1. Examination of milk

   **i)** DMC

   **ii)** Quantitative analysis of milk by SPC (using nutrient agar)

2. Phosphatase Test (qualitative)

3. Isolaton and identification of microorganisms from spoiled food

4.Bioassay of Streptomycin

5. Estimation of alcohol by using K2Cr2O7

6.Diauxic growth curve of Escherichia coli (glucose and lactose).

7.Immobilization of enzyme by using Sodium alginate

8.Thin layer chromatography- amino acid

9.Study of Substrate concentration on enzyme activity.

10.Purification of enzyme and study of its activity

11.Production of citic acid by Aspergillus niger and estimation of Citric acid by titration method

12.Bioassay of Vitamin B12

13.Sterility testing of media and pharmaceutical products

14..Isolation of Lactic acid Bacteria (MRS Medium)

15.Amylase assay (Iodometric method)

## Practical Examination

A) The university practical examination will be conducted on four (4) consecutive days for not less than 6 hours on each day of the practical examination. The practical examination shall be conducted by the two external examiners appointed by the University.
B) Each candidate must produce a certificate from the Head of the Department in his/her college stating that he/she has completed in a satisfactory manner the practical course on the guidelines laid down from time to time by Academic council on the recommendation of Board of studies and has recorded his/her observations in the laboratory journal and written a report on each exercise performed. Every journal is to be checked and signed periodically by a member teaching staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journal at the time of practical examination. Candidate has to visit two places of Microbiological interest (Pharmaceutical industry, Dairy, Research institutes etc) and submit the report of their visit at the time of examination. The report should be duly certified by the Head of the Department.

**Distribution of Marks for practical examination**

1) One major experiment: 30 marks
2) Two minor experiment: 15 marks each
3) Journal: 5 marks
4) Viva:10

**Total marks:**

Practical V: 75
Practical VI: 75
Practical VII: 75
Practical VIII: 75
Tour Report : 20
**Total Marks: 320**

Practical V Marks: 75

### Que1. Major Experiments

Isolation of DNA from bacteria by J. Marmur's method

OR

Isolation of coliphages from sewage

**Que2. Minor Experiments**

One step growth curve
OR

Determination of dose of U.V. by UV survival curve

OR
Cultivation of Viruses in Embryonated chicken egg

OR

Study of Virally infected lesions of Plant materials
OR

Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites

**Que3. Minor Experiments**

Isolation of Lac negative mutants of *E.coli* by visual detection method.
OR
Isolation of Streptomycin resistant mutants by gradient plate technique.
OR
Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
OR
Exploring protein sequence database (PDB) and GeneBank and BLAST.

**Practical VI**

**Que 1 Major Experiment**

Isolation of **Azotobacter**from soil. (Identification up to genus level)

OR

Isolation of ***Rhizobium*** from root nodules.

OR

Isolation of ***Xanthomonas***from infected plant material

OR
Biological Oxygen Demand (BOD)
OR

Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test

**Que2 Minor Experiment**

SPC of market **Biofertilizers.**

OR

Determination of potability of water by MPN.

**Que 3 Minor Experiment**

Estimation of available phosphorous from soil (Stannous chloride method)

OR

Estimation of Calcium and Magnesium from soil (EDTA method)

OR

Determination of organic carbon contents of soil (Walkley and Black method)

OR

Waste water analysis: Chemical Oxygen Demand (COD)

## Practical VII

**Que. 1 Major Experiment**

Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*

**Que 2 Minor Experiment**

Widal test (quantitative test)/ RA test,/Pregnancy test

OR

Estimation of Hb by Sahlis method

OR

RBC count/ WBC count/differential WBC count

OR

Determination of Erythrocyte sedimentation Rate

OR

Microscopic examination – pus cells, RBC, bacteria, crystals.

OR

Chemical examination – glucose (benedict's method,protein (acetic acid),bile salt (sulphur method), ketone bodies (Rothera's test)

**Que. 3 Minor Experiment**

Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% $H_2O_2$, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli, Staphylococcus aureus, Bacillus*) by disc diffusion method

OR

Antimicrobial susceptibility testing by disc diffusionmethod

## Practical VIII

**Que 1 Major experiment**

Bioassay of Streptomycin

OR

Bioassay of Vitamin B12

OR

Isolaton and identification of microorganisms from spoiled food

OR

Examination of milk -DMC & Quantitative analysis of milk by SPC (using nutrient agar)

OR

Isolation of Lactic acid Bacteria (MRS Medium

**Que 2 Minor Experiment**

Phosphatase Test(qualitative)

OR

Estimation of alcohol by using $K_2Cr_2O_7$

OR

Diauxic growth curve of Escherichia coli (glucose and lactose).

OR

Sterility testing of media and pharmaceutical products

OR

Amylase assay (Iodometric method)

**Que 3Minor Experiment**

.Immobilization of enzyme by using Sodium alginate

OR

Thin layer chromatography- amino acid

OR

Study of Substrate concentration on enzyme activity.

OR

Purification of enzyme and study of its activity

OR

Estimation of Citric acid by titration method

.

**List of the Minimum equipments and related requirements for B.Sc – III**

1) Replica plating units for genetics experiments: Two
2) Rotary shaker for fermentation experiments: One
3) Centrifuge (High speed): One
4) Hot plate: One
5) Hot air oven: One
6) Bacteriological incubator: One
7) Spectrophotometer: One
8) Research Microscope: one for each student
9) Haemocytometer: Two
10) Haemoglobinometer: Two
11) ESR stands and tubes: Two
12) Separate room for fine instruments of size 10'×15' feet dimension
13) A separate culture room of at least 10'×10' feet dimension
14) Electrophoresis assembly: One
15) Laminar air flow cabinet: One
16) Distillation assembly: One (Glass)
17) Reflux assembly: Four
18) Serological water bath: One
19) Colony counter: One
20) Refrigerator: One
21) TLC UNIT: One
22) Hand Refractometer
23) Computer with Internet facilities and printer: One
24) Micropipette: One
25) Anaerobic Jar: One
26) Heating Mantle: One
27) UV Chamber

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur


NAAC Accredited-2015
'B' Grade (CGPA 2.62)

## Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

## Syllabus: Computer Science

**Name of the Course: B. Sc. Part- III (Sem. V & VI)**

**(Syllabus to be implemented from w.e.f. June 2021)**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**Syllabus for B.Sc. Part – III (CBCS Semester Pattern)**

**Computer Science (W.E.F. June 2021)**

| Name and Type of the Paper | | Title of Paper | Hrs/Wee | | Total Marks per paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|
| **Type** | **Name** | | **L** | **P** | | | | |
| **B.Sc.- III Semester - V** | | | | | | | | |
| English (Business English) | English (Business English) | | 4 | - | 50 | 40 | 10 | 2.0 |
| DSE 1 A | Paper IX | Visual Programming Using C# | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 2 A | Paper X | Core Java | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 3 A | Paper XI | Operating System | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 4 A | Paper XII | Python | 4 | - | 100 | 80 | 20 | 4.0 |
| SEC 3 | Paper XIII | Linux | 4 | - | 100 | 80 | 20 | 4.0 |
| | **Total (Theory)** | | **24** | **-** | **550** | **440** | **110** | **22.0** |
| **B.Sc.- III Semester - VI** | | | | | | | | |
| English (Business English) | English (Business English) | | 4 | - | 50 | 40 | 10 | 2.0 |
| DSE 1 B | Paper XIV | Web Technology | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 2 B | Paper XV | Advanced Java | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 3 B | Paper XVI | Data Communication and Networking | 4 | - | 100 | 80 | 20 | 4.0 |
| DSE 4 B | Paper XVII | Advance Python | 4 | - | 100 | 80 | 20 | 4.0 |
| SEC 4 | Paper XVIII | Software Testing | 4 | - | 100 | 80 | 20 | 4.0 |
| | **Total (Theory)** | | **24** | **-** | **550** | **440** | **110** | **22.0** |
| **Practical** | | | | | | | | |
| DSE 1A &1B | Practical IV | Practical On C# and Asp.Net | - | 5 | 100 | 80 | 20 | 4.0 |
| DSE 2A &2B | Practical V | Practical on Core Java and Advanced Java | - | 5 | 100 | 80 | 20 | 4.0 |
| DSE 4A &4B | Practical VI | Practical on Python and Advance Python | - | 5 | 100 | 80 | 20 | 4.0 |
| | Practical VII | Project | - | 5 | 100 | 80 | 20 | 4.0 |
| | **Total (Practical)** | | **-** | **20** | **400** | **320** | **80** | **16.0** |
| **Grand Total** | | | **48** | **20** | **1500** | **1200** | **300** | **60.0** |

**Note:**

1. Practical IV, Practical V, Practical VI and Practical VII are as per guidelines of Science Faculty.
2. Nature of internal examination, passing standard, ATKT and the conversion of marks into grades and credits are as per guidelines of Science Faculty Credit and Grading System

**Equivalence papers for B.Sc.-III Sem V and VI (Computer Science)**

| Sr. No | Old Paper | New Paper |
|---|---|---|
| **B.Sc.- III Semester - V** | | |
| 1 | Visual Programming Using C# | Visual Programming Using C# (Sem-V) |
| 2 | Core Java | Core Java (Sem-V) |
| 3 | Operating System | Operating System (Sem-V) |
| 4 | Python | Python (Sem-V) |
| 5 | Software Testing | Software Testing (Sem-VI) |
| **B.Sc.- III Semester - V** | | |
| 6 | Web Technology | Web Technology (Sem-VI) |
| 7 | Advanced Java | Advanced Java (Sem-VI) |
| 8 | Data Communication and Networking | Data Communication and Networking (Sem-VI) |
| 9 | AngularJS | **No Equivalence** |
| 10 | Linux Operating System | Linux Operating System (Sem-V) |

# Semester – V

## Paper IX: -Visual Programming Using C#

### Objectives: -

Students will try to learn:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To understand how to design GUI base windows application using C#.

**Unit 1: Introduction to NET and C# (10)**

Block diagram of .net framework, The Common Language Runtime, Advantages of Managed Code, A Closer Look at Intermediate Language & Assemblies-Support for Object Orientation and Interfaces, Distinct Value and Reference Types, Strong Data Typing, Garbage Collection, Compiling and Running the Program, Variables, Data Types, Flow Control, Enumerations, Namespaces-The using Statement, Namespace Aliases, The Main() Method-Multiple Main() Methods, defining & using functions & its scope, Passing Arguments to Main(), Parameter passing technique.

**Unit 2: Object oriented programming in C# (10)**

Classes and Structs, Class Members- Data Members, Function Members read-only Fields, properties and indexer, The Object Class-System, Object Methods, The ToString() Method

**Inheritance and Polymorphism:** Introduction-Types of Inheritance, Implementation Inheritance-Abstract Classes and Functions, Sealed Classes and Functions, Constructors and its types, Destructor, Interfaces-Defining and Implementing Interfaces, Derived Interfaces, Polymorphism - Method overloading, Operator overloading.

**Unit 3:- Exception, Threading, Delegate and IO (15)**

**Exception Handling:-**Try, catch, and throw, finally, Nested try, Custom exception

**Threading:-**Introduction- Applications with Multiple Threads, Thread Priorities, Synchronization, Life Cycle.

**Delegate and Events:-** Delegeates, Types of delegates- single cast, multicast and anonymous delegates, Event

**IO and Collection Classes:-** Stream Classes, Console I/O, File Stream and Byte-Oriented File I/O, Character based File I/O.

**Unit 4:- Windows Applications (10)**

**Controls:** Common control Group, Data control Group, Dialog control Group, Container control Group, Menus and Context Menus: Menu Strip, Toolbar Strip, SDI and MDI Applications

**Outcomes:-**

Students will be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity using Java.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem in Java.
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Able to develop windows applications using C#.

**Reference books:**


1. Professional C# - Wrox Publication by Simon Robinson, Christain Nagel, Karli Watson, Jay Glynn, Morgan Skinner, Bill Evjen.
2. Inside C# - Microsoft Press by Tom Archer, Andrew Whitechapel.
3. Programming Microsoft Visual C# 2005 - The Language (Microsoft Press) by Donis Marshall

# Paper X:-Core Java

## Objectives:-

Students will try to learn:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To understand how to develop GUI applications using Swing technology

**Unit 1: Introduction to Java Programming (10)**

Overview of Java, Features of Java as programming language /Platform, JDK Environment and Tools

**Java Programming Fundaments:-**Data types, Variables, Operators, Keywords, Naming Conventions, Structure of Java Program, Flow Control- Decision, Iterations, Arrays,

**Unit 2: Object oriented programming in Java (10)**

Class – Members access control, Objects, Constructors, Use of 'this' keyword, Static, non-static data members and methods., public, private & protected data members

**Inheritance & Polymorphism-**Access/Scope specifiers protected, Super, extends, single, multiple inheritance, Method overriding, Abstract classes & ADT, 'final' keyword, Extending interfaces

**Unit 3: Exception Handling, Threading and Collection framework (15)**

Exceptions and Types, try..catch, finally block, throw & throws statement, user-defined exceptions, Java I/O package, byte & character stream, reader & writer, file reader & writer

**Threading-**Java thread lifecycle, Thread class & run able interface Thread priorities & synchronization, Usage of

wait & notify

**Collection framework :-** Collection overview, Collection interfaces, Collection classes Vector, Array list, Hash map, Hash table, Tree map, Tree set, Hash set, Properties, Stack

**Unit 4: Swing and event handling: (10)**

Introduction to swing, difference between AWT and swing, hierarchy of Swing classes, Swing controls: - JButton, JTextfield, JLabel, JCheckBox, JRadionButton, JFame, Jtable, JList, JoptionPane, JMenuitem and JMenu ,etc

**Outcomes:-**

Students will be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity using Java.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem in Java.
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Able to develop GUI applications using Swing technology.

**Reference Books:**


1. Java 2 for professional developers by Michael Morgen
2. Core Java Vol 1 and vol 2 by Cay. S. Horstmann, Gray Cornell.
3. Java by Nutshell
4. Java The complete Reference by Herbert Schildt
5. Thinking in java by Brucel

# Paper XI:-Operating System

## Objective:-

Students will try to learn:

1. To understand the main components of an OS & their functions.
2. To study the process management and scheduling.
3. To understand the concepts and implementation Memory management policies and virtual memory.
4. To understand the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS

**Unit 1: Introduction Operating System:-** **(10)**

Definition Operating systems, Types of Operating Systems-Batch, Multiprogramming, Time-Sharing, Real-Time, Distributed, Parallel., OS Service, System components, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine

**Unit 2: Process Management: -** **(10)**

Concept of Process, Process states, Process Control Block, Context switching, Operations on Process, Co-operating Process, Threads – Types of threads, Benefits of threads.

Concept of Process Scheduling- Types of Schedulers, Scheduling criteria, Scheduling algorithms-Preemptive and Non-pre emptive , FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queu Scheduling, Multilevel- feedback Queue Scheduling.

**Unit 3: Process Synchronization and Deadlocks: -** (10)

The Producer Consumer Problem, Race Conditions, Critical Section Problem, Semaphores, Classical Problems of Synchronization: Reader-Writer Problem, Dinning Philosopher Problem, Critical Regions.

Definition, System Model, Dead Lock Characterization, Resource Allocation Graph, Methods of Handling Dead Locks- Deadlock Prevention, Deadlock Avoidance -banker's algorithm, resource request algorithm, Deadlock detection and Recovery.

**Unit 4: Storage Management** **(15)**

**Memory Management:** - Basic Hardware Address Binding, Logical and Physical address Space, Dynamic Loading, Overlays, Swapping,

**Memory allocation:** Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction, Paging, Segmentation. Basics of Virtual Memory,

demand paging, Page fault, Page Replacement policies: Optimal (OPT), First in First Out (FIFO), Least Recently used (LRU), Thrashing.

**Storage Management:-** File Management: File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free space management (bit vector, linked list, grouping).

**Disk Management:** disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

## Outcomes:-

Students will able to:

1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
2. Understand the process management policies and scheduling of processes by CPU
3. Evaluate the requirement for process synchronization and coordination handled by operating system
4. Describe and analyze the memory management and its allocation policies.
5. Identify use and evaluate the storage management policies with respect to different storage management technologies.

**Reference Books:**


1. System programming and O.S. By D.M. Dhamdhere.
2. Modern O.S. By Andrews Tanenbaum.
3. Operating System Concepts By Siberchatz and Galvin.
4. Operating System(Unix) By Bach

# Paper XII:-Python

**Objectives:-**

Students will try to learn:

1. Basics of Python programming
2. Decision Making and Functions in Python
3. Object Oriented Programming using Python
4. Files Handling in Python
5. Regular expression for pattern matching

**Unit 1:- Introduction to Python: (10)**

Features/Characteristics of Python, Installation and Working with Python, Structure of a Python Program, Writing simple python program, Executing python program using command line window and IDLE graphics window, Python Virtual Machine, Identifiers and Keywords, Operators (Arithmetic operators, Relational operators, Logical or Boolean operators, Assignment Operators, Bit wise operators, Membership operators, Identity operators), Operator Precedence and Associativity

**Python Data Types: -**Python Variables, Data types in python, Built-in Datatypes, Bool datatype , Sequences in python, Sets, Literals in python, User Defined Datatypes, Constants in python, Type conversion, Input and Output Statements, Command line arguments

**Control Statements:-**Conditional Statements: if, if-else, nested if –else, Looping: for, while, nested loops, Loop manipulation using pass, continue, break, assert and else suite

**Unit 2:- Strings, Collection Lists, Tuples, Dictionaries, Functions and, Modules: (10)**

Strings: Introduction to String, String Manipulation., Collection List: Introduction to List, Manipulating list., Tuples: Introduction to Tuples, Manipulating Tuples., Dictionaries: Concept of Dictionary, Techniques to create, update & delete dictionary items.

**Functions, Modules :-** Difference between a Function and a Method, Functions:- Defining a function, Calling a function, Advantages of functions, Types of functions, Function parameters:- Formal parameters, Actual parameters, Anonymous functions, Global and Local variables, Modules:- Importing module, Creating & exploring modules, Math module, Random module, Time module

**Unit 3:- Object Oriented Programming (6) (15)**

Features, Concept of Class & Objects, Constructor, Types of Variables, Namespaces, Types of Methods, Inner Classes, Constructors in Inheritance, Overriding Super Class Constructors and

Methods, Types of Inheritance, Abstract Classes and Interfaces, The Super() Method, Operator Overloading, Method Overloading, Method Overriding

**Unit 4: Regular Expressions, Exception Handling and File (10)**

Introduction to Regular Expression, Advantages & Operations, Sequence characters in Regular Expression, Powerful pattern matching and searching, Password, email, url validation using regular expression, Pattern finding programs using regular expression

**Exception :-** Errors in a Program, Exceptions, Exception handling, Types of Exceptions, User-defined Exceptions

**Python File Operation:-** Types of File, Opening and Closing a File, Reading and writing to files, Manipulating directories

## Outcomes:-

Students will be able to:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision Making statements and Functions
3. Interpret Object oriented programming in Python
4. Understand and summarize different File handling operations
5. Understand Regular expression and implement for pattern matching.

**Reference Books**


1. Beginning Python by Magnus Lie Hetland-Apress
2. Python Programming for the Absolute Beginner by Michael Dawson-Cengage Learning
3. Python for Everybody: Exploring Data in Python 3 by Charles Severance-CreateSpace Independent Publishing Platform
4. Introducing Python: Modern Computing in Simple Packages by Bill Lubanovic-O'Reilly Media
5. Python Programming for Beginners: An Introduction to the Python Computer by Jason Cannon- CreateSpace Independent Publishing Platform
6. Python for Beginners by Harsh Bhasin

# Paper XIII:-Linux

## Objectives:-

Students will try to learn:

1. To introduce Basic Linux general purpose Commands
2. To learn different editor
3. To learn shell script concepts.
4. To learn file management and permission advance commands.
5. To learn awk, grap, perl scripts.

**Unit 1: Introduction of Linux:-** **(10)**

History of Linux, Architecture of Linux system & features, Kernel, Shell & its type, Difference between Windows and Linux. Linux Distributions, Working environments: KDE, GNOME, Xface4, Hardware requirement, Installation procedure of Linux, Create partitions, Configuration of X system Users & Groups Management:- Create Users, Create groups, Special groups, Assigning permissions to users and Groups, File and Directory permissions- chmod, chown, chgrp.

**Linux File System:-**Hierarchy of File system, File System parts- Boot Block, Super Block, Inode Block, Data Block, File types, Devices and Drives in Linux, Mounting devices (CD/DVD, usb, hard drive partition ), file system

**Unit 2: Linux Command** **(15)**

**Linux commands** File and directory Management Commands:-mkdir, rmdir, cd and pwd, file, ls, cat, more, less, File and Directory Operations: find, cp, mv, rm, ln etc, Printing the files - lpr, lpq, lprm etc.

**Filter Commands & Editor:-** Filters: head, tail , pr, cut, paste, sort, uniq, tr, grep, egrep, fgrep, sed.

**Communication commands:-** mesg, talk, write, wall, mail.

**Text Editors**- vi, vim, Archive and File compression commands

**Shell Programming:-** Shell Variables, Meta characters, Shell Scripts – Control and Loop structure, I/O and Redirection, Piping,

**Unit 3: Linux System Management (10)**

**Process Management:** Shell process, Parent and children, Process status, System process, Multiple jobs in background and foreground, Changing process priority with nice. Listing processes, ps, kill, premature termination of process.

**Disk management and System Administration:-**Disk Partitioning- RAID, LVM etc., disk related Management Tools- Fdisk, Parted etc. , Boot Loaders- GRUB, LILO, Custom Loaders

**Unit 4:-Linux System and Network Administration (10)**

System administration – Role of system administrator, identifying administrative tasks & files, Configuration and log files, Chkconfig, Security Enhanced Linux, Installing and removing packages with rpm command

**Understanding various Servers**:- DHCP, DNS, Squid, Apache, Telnet, FTP, Samba.

**Outcomes:-**

Students will be able to:

1. Identify the basic Linux general purpose commands.
2. Apply and change the ownership and file permissions using advance Linux commands.
3. Use the awk, grep, perl scripts.
4. Implement shell scripts.
5. Apply basic of administrative task.

**Reference Books :**


1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. UNIX for programmers and users by Graham Glass & King Ables, Pearson Education
3. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India
4. Red Hat Linux Bible by Cristopher Negus, Wiley Dreamtech India
5. UNIX Shell Programming by Yeswant Kanethkar, BPB

# Semester – VI

## Paper XIV:- Web Technology

**Objectives:-**

Students will try to learn:

1. To understand basic of ASP.Net
2. To understand different server controls used in ASP.Net for web application.
3. To understand master page concept
4. To learn how to maintain state and security in web application.
5. To understand database connectivity with web application.

**Unit 1: Introduction to ASP.Net (10)**

Introduction to Web Architecture Model, Introduction to Visual Studio for Web Application, historical development of ASP.Net

**Application and Page Frameworks**

Application Location Options, Built-In Web Server, IIS,FTP, Web Site Requiring FrontPage, Extensions, The ASP.NET Page Life Cycle, The ASP.NET Page Structure Options, Inline Coding, New Code-Behind Pages, ASP.NET 2.0 Page Directives, @Page, @Master, @Control, @Import, @Implements, @Register, @Assembly, @PreviousPageType, @MasterType, @OutputCache, @Reference. ASP.NET Page Events, Dealing with PostBacks, Cross-Page Posting, ASP.NET Application Folders, \App_Code Folder, \App_Data Folder, \App_Themes Folder, \App_GlobalResources Folder, \App_LocalResources, \App_WebReferences, \App_Browsers, Compilation, Global.asax

**Unit 2: ASP.NET Server Controls and Validation Controls (10)**

ASP.Net Server Controls, Understanding Validation, Client-Side versus Server-Side, Validation, ASP.NET Validation Server Controls, Validation Causes, The Required Field Validator Server Control, The CompareValidator Server Control, The RangeValidator Server Control, The RegularExpressionValidator Server Control, The CustomValidator Server Control, The ValidationSummary Server Control, Turning Off Client-Side Validation, Using Images and Sounds for Error Notifications, Working with Validation Groups

**Master Pages:-** Introduction of Master Pages- The Basics of Master Pages, Coding a Master Page, Coding a Content Page, Mixing Page Types and Languages, Specifying Which Master Page to Use, Working with the Page Title, Working with Controls and Properties from the Master Page,

Specifying Default Content in the Master Page, Programmatically Assigning the Master Page, Nesting Master Pages, Master Page Events, Themes and Skins

**Unit 3: ASP.Net State Management, Navigation and Security (15)**

Application State, Session State, Client & server storing, View state, Cache, Hidden Variable, Session object, Profiles, Overview of HTTP Handler & Modules

**Site Navigation:-** Site Navigation technique, SiteMap file, SiteMapPath, TreeView and MenuView control, Using XML file

**ASP.NET web security:-** Authentication & Authorization, Windows & forms, User.identity, User.IsInRoles, Using Data Adapter, Debugging & error Handling, ASP.Net tracing, Page Level, Application Level, Debugging, Start Debugging session, Client side debugging, Exception Handling, On page, HTTP status code,

**Unit 4: ADO.Net and AJAX (10)**

**Data Access with ADO.NET:-** ADO.NET Overview, Using Database Connections, Executing Commands, Calling Stored Procedures, Fast Data Access: The Data Reader, Data Adapter

**Introduction to AJAX:-** Introduction to AJAX and Need of AJAX, Server side and client side architecture ScriptManager, UpdatePanel, Timer control.

**Outcomes:-**

Students will be able to:

1. Understand basic of ASP.Net and web application.
2. Use different ASP.Net web server control to develop web application.
3. Use master page for interactive design
4. Maintain state and security in web application.
5. Connect any database with web application.

**Reference Books:**


1. Professional ASP.NET– Wrox Publication by Bill Evjen, Scott Hanselman, Farhan Muhammed, Sirnivasa Sivakumar, Devin Rader.
2. Microsoft ASP.NET Step by Step - Microsoft Press by George Shepherd.

# Paper XV:- Advanced Java

**Objectives:-**

Students will try to learn:

1. To understand database connectivity using JDBC.
2. To learn how to develop web applications using servlet.
3. How to develop web applications using JSP.
4. To Understand concept of hibernate and struts.

**Unit -1:-JDBC (10)**

Introducing JDBC: Describing Components of JDBC, Features of JDBC, JDBC Architecture: Types of Divers:Advantages and disadvantages of Drives, Use of Drivers, JDBC Statement and Methods:-Statement, PreparedStatement, CallableStatement, execute(), executeQuery(), executeUpdate(), Working with Resultset interface,Working with Resultset and MetaData.

**Unit -2:-Servlet (15)**

Introducing CGI, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Introducing Servlet API, Javax.servlet package, Javax.servlet.http package, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Servlet life Cycle, Init(), Service(), Destroy(), Working with GenericServlet and HttpServlet, RequestDispatcher interface, Include() and forward(), Use of RequestDispatcher, Session in Servlet, Introducing session, Session tracking mechanism, Cookies, Advantages & disadvantages, use of cookies, Hidden form filed, Advantages & disadvantages, use of Hidden form filed, URL rewritten, disadvantages, use of URL rewritten, HttpSession, Advantages & disadvantages,use of URL HttpSession

**Unit -3:- JSP (10)**

Introduction to JSP, Advantages of JSP over Servlet, JSP architecture, JSP life cycle, Implicit objects in JSP- request, response, out, page, pageContext, application, session, config, exception, JSP tag elements- Declarative, Declaration, scriplet, expression, action., Java Bean- Advantages & Disadvantages, useBean tag- setProperty and getProperty, Bean In Jsp, JSTL core tag: General purpose tag, conditional tag, networking tag, JSTL SQL tags, Custom tag: empty tag, body content tag, iteration tag, simple tag

**Unit -4:- Hibernate and Struts (10)**

Introduction Hibernate(HB), Architecture of HB, Generator classes, Steps to create application of HB:- HB with annotation, Insert ,Delete,update,retrive records from database in HB, HB web application

**Struts:-** Introduction to struts, What is struts, Use of struts, Features of Struts, Architecture of struts, Steps to create application of struts

## Outcomes:-

Students will be able to:

1. Use database connectivity using JDBC.
2. Develop web applications using servlet.
3. Develop web applications using JSP.
4. To use the concept of hibernate and struts.

**Reference Books**


1. Java The complete Reference by Herbert Schildt
2. Java Servlet Programming by Jasan Hunter
3. Beginning Java EE5 from Novice to Professionals by K. Makhar & C. Zelenk
4. Java Server Programming by Bayross & Shah
5. Thinking in java by Brucel

## Paper XVI:-Data Communication and Networking

### Objective: -

Students will try to learn:

1. Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model.
2. Acquire knowledge of Application layer and Presentation layer paradigms and protocols.
3. Study Session layer design issues, Transport layer services, and protocols.
4. Study data link layer concepts, design issues, and protocols.
5. Read the fundamentals and basics of Physical layer, and will apply them in real time applications.

**Unit 1. Introduction to Data Communication & Networking (10)**

Data Communication: Components, Data Flow, Protocols & Standards, Design Issues of Layers, Connection oriented and connection less services, Network models :- ISO-OSI reference model, TCP/IP reference model.

**Unit 2. Physical layer (10)**

Signals: Analog & Digital Signals, Period, Frequency, Phase, Amplitude, Bandwidth, Bit Rate, Bit Length, Fourier analysis. Transmission Impairment: Attenuation, Distortion, Noise, Nyquiest Theorem, Shannon Capacity Theorem.

Transmission Media:-Guided Media-Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optic Cable,

Unguided Media:- Wireless- Radio Waves, Microwaves, Infrared, Satellite Communication

Digital Transmission: Manchester & Differential Manchester Coding, Pulse Code Modulation

Modulation:- Amplitude Modulation, Frequency Modulation, Phase Modulation

Transmission Mode: Parallel, Serial, Synchronous Transmission, Asynchronous Transmission.

Multiplexing- Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing.

Switching- Circuit Switching, Message Switching, Packet Switching.

**Unit 3. Data link layer (15)**

Error Detection & Correction: Types of Errors, Hamming Distance, Error Detection: Parity Check, Cyclic Redundancy Check, Checksum Check, hamming code

Data Link Control: Framing, Flow & Error Control,

Protocols: Simplex, Stop and Wait, Stop and Wait ARQ, Go Back N ARQ, Selective repeat ARQ,

HDLC, Point to Point protocol.

Multiple Access Protocol: ALOHA, CSMA, CSMA/CD,

CSMA/CA Channelization, FDMA, TDMA, CDMA

**Unit 4. Network layer , Transport, Session, Presentation & Application layers (10)**

Network layer Design issues, Routing Algorithm: Optimality Principle, Shortest Path Routing, Distance Vector Routing, Link State Routing.

Congestion Control Algorithm: General principle of congestion control, Congestion prevention policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets

Network Devices-Hubs, Switches, Repeaters, Bridges, Routers, Gateways

**Transport, Session, Presentation & Application layers (5)**

TCP/IP protocol suite :- UDP,TCP,SCTP, IP, RTP, FTP, DNS, TELNET, SMTP, POP, HTTP, WWW, SNMP,ARP, RARP.

Data Compression:-Audio Compression, Video Compression

## Outcomes:-

Students will able to:

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
3. Describe the Session layer and Transport layer.
4. Describe the functions of data link layer and explain the protocols.
5. Explain the types of transmission media with real time applications

**Reference Books:**


1. Computer Networking by Tannenbaum.
2. Data communication and networking by William Stallings
3. Data communication and networking by B A Forouzan
4. Data communication and networking by Jain

# Paper XVII:- Advance Python

## Objective:-

Students will try to learn:

1. Windows application development in python using Tkinter.
2. MySql open source database.
3. Web application development using Django framework.
4. Concept of XML in python and network programming in Python

**Unit – I:- Windows Applications using Tkinter (10)**

GUI Programming GUI in Python, Advantages of GUI, Introduction to GUI library, Basic Operations using Tkinter, Root Window, Working with Containers: Frame, Canvas Layout Management, Events and Bindings, Font, Colors, drawing on Canvas (line, oval, rectangle, etc.) Widgets: Label, Button, Checkbutton, Entry, Listbox, Message, Radiobutton, Text, Spinbox, Scrollbar, Menu etc. Writing Python Programs for GUI applications

**Unit – II:- Database Connectivity using MySQL (10)**

Installation of MySQL Database Software, Installing MySQL Connector, Steps for Database Connectivity, Working with MySQL Database : Inserting, Retrieving, Deleting and Updating the data Working with Stored Procedure

**Unit – III:- Web Application using Django (15)**

What Is a Web Framework? The MVC Design Pattern, Django's History, Advantages of Django, Understanding Django environment, Installing Django, Setting Up a Database

Django architecture, The Development Server, Django Commands Overview, Starting a Project, Django apps, Difference between app and project, The Project Structure, Setting Up Your Project, Create an Application

Migration, Admin Panel. Views in Django, URL Routing, Template in Django, Models in Django, Forms in Django.

**Unit – IV- XML and Networking (10)**

Introduction to XML, XML Parser Architecture and API's, Parsing XML with SAX API's, Parsing XML with DOM API's

**Network Programming:-** Introduction to Sockets Programming, Server Socket Methods, Client Socket Methods, IP Address, URL, TCP/IP Server, TCP/IP Client, Sending E-mail Application

## Outcomes:-

Students will able to:

1. Develop windows application in python using Tkinter library.
2. Basic and advance concept of MySql open source database.
3. Develop web application and web project using Django framework.
4. Understand Concept of XML in python and network programming in Python

## Reference Books:


1. MySQL for Python: Database Access Made Easy- A. Lukaszewski
2. Beginning Django: Web Application Development and Deployment with Python-Daniel Rubio-Apress
3. Django Unleashed- Andrew Pinkham-SAMS
4. Practical Django Projects- James Bennett-Apress
5. Python GUI Programming with Tkinter- Alan D. Moore-Packt
6. Tkinter GUI Application Development H TSHOT - Bhaskar Chaudhary -Packt

## Paper XVIII:- Software Testing

### Objective:-

Students will try to learn:

1. Basic software debugging methods.
2. White box testing methods and techniques.
3. Black Box testing methods and techniques.
4. Designing test plans.
5. Different testing tools (familiar with open source tools)

**Unit 1:-Introduction To Software Testing: (10)**

What is Software Testing?, Use or need of software testing. ,Software Development Life Cycle (SDLC) :- Water Fall Model, Spiral Model, V- Model, Prototype Model, Hybrid Model

**Unit- 2 White Box and Black Box Testing: (10)**

Introduction to White box testing, Advantages and Disadvantages of White box testing, Loop Testing, Path Testing , Condition testing , Memory Testing , Performance Testing

**Black Box Testing:**

Introduction to black box testing , Advantages and Disadvantages of black box testing , unctional Testing- Integration Testing (Incremental Integration Testing ) ,Top Down Incremental Integration Testing , Bottom Up Incremental Integration Testing , Non Incremental Integration Testing , System Testing , Acceptance Testing , Smoke Testing , Exploratory Testing , Adhoc Testing , Performance Testing – Load Testing, Stress Testing, Volume Testing, Soak Testing, Regression Testing-Unit Regression Testing/Retest, Regional Regression Testing, Full Regression Testing

**Unit- 3 Test cases and its design Techniques: (15)**

Introduction to Test Case , Characteristics Of Good Test Case , Test Case Template, How To Write A Test Case, How To Ensure The Test Coverage Is Good , How To Identify whether It Is a Good Test Case Or Not, Review Process/Peer Review , Preparing Review Report, Examples On Writing Test Cases, Test Cases Design Techniques-Error Guessing, Equivalence Partitioning, Boundary Value Analysis

**Unit- 4 Software Test Life cycle and Defect Life Cycle: (10)**

Software Test Life Cycle-Writing Test Plan, Preparing Traceability Matrix, Writing Test Execution Report, Summary Report, Retrospect Meeting /Triage Meetings, Defect Life Cycle-Concept of Defect life cycle, Difference between Bug, Defect, Failure, Error

## Outcomes:-

Students will able to:

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning.
4. Manage the test process
5. Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

**Reference Books:**


1. The art of Software Testing– Glenford J. Myers
2. Lessons learned in Software Testing – CemKaner, James Bach, Bret Pettichord
3. A Practitioner's Guide to Software Test Design- Lee Copeland
4. Software Testing Techniques, 2nd edition- Boris Beizer
5. How to Break Software: A Practical Guide to Testing- James Whittaker

## Sample Assignments on Visual Programming

1. Write a menu driven of a] Face value b]Armstrong c]Palindrome.
2. Write a program that implement features of cross language support.
3. Write a program to overload method
4. Write a program that method should return object, Array.
5. Write a program for static class and partial class.
6. Write a program for static property.
7. Write a program for indexer.
8. Write a program to implement inheritance.
9. Write a program to overloading operator.
10. Write a program that implement interface.
11. Write a program that implement hash table.
12. Write a program that implement arraylist by using windows application.
13. Write a program that implement data structure by using windows application.
14. Write a program for delegate and event.
15. Write a program for Reading/Writing file by using byte stream class.
16. Write a program for copy one file to another file.
17. Write a program creating files & directories & display the following attribute- 1] Name 2] Size 3] Getcreationtime by using windows application.
18. Write a program for thread.
19. Design windows application which demonstrate common controls.
20. Design windows application which demonstrate Dialog group.

## Sample Assignment on Java Practical

1. To find the factorial of a given number
2. To learn use of single dimensional array by defining the array dynamically.
3. To check if a number is prime or not, by taking the number as input from the keyboard
4. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(), setLength(), append(), insert(), concat()and equals().
5. Write a program to create a "distance" class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer
6. Modify the "distance" class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.
7. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)
8. Write a program to show the difference between public and private access specifiers. The program should also show that primitive data types are passed by value and objects are passed by reference and to learn use of final keyword
9. Create a multi-file program where in one file a string message is taken as input from the user and the function to display the message on the screen is given in another file (make use of Scanner package in this program).
10. Write a program to create a multilevel package and creates a reusable class to generate Fibonacci series, where the function to generate Fibonacci series is given in a different file belonging to the same package.
11. Write a program "Divide by Zero that takes two numbers a and b as input, computes a/b, and invokes Arithmetic Exception to generate a message when the denominator is zero.
12. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
13. Write a program to create your own exception types to handle situation specific to your application (Hint: Define a subclass of Exception which itself is a subclass of Throwable).
14. Write a program to demonstrate priorities among multiple threads.
15. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).

16. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged().
17. Write a program to demonstrate different keyboard handling events.
18. Write a program to demonstrate the use of push buttons.
19. Write a program to demonstrate collection classes.
20. Write a program to implement interface.

## Sample Assignment on Python

1. Write a program to print strings, numbers and perform simple mathematical calculations.
2. Write a program to implement command line arguments.
3. Write a program to implements conditional statements -if, if-else, nested if.
4. Write a program to implement loops.
5. Write a program which demonstrate random module.
6. Write a program which create file and the content of file will be DNA sequence created by random module.
7. Write a program to demonstrate date related module.
8. Write a program to manipulate strings like string copy, string concatenation, string comparison, string length, string reverse etc.
9. Write program to show use of Lists and Tuples.
10. Write program which uses dictionaries
11. Write program to implement functions & Modules
12. Write program to implement Package.
13. Write a program to implement Constructors.
14. Write a program to implement types of Inheritance and Interfaces.
15. Write a program to implement Method Overloading and Method Overriding.
16. Write a program to implement Operator Overloading.
17. Write a program in to read and write contents in a file.
18. Write a program to demonstrate Exception handling
19. Write a program to demonstrate user defined exception.
20. Write a program to demonstrate the use of regular expressions

## Sample Assignment on Web technology

1. Write a JavaScript for Addition, Subtraction, Division, and Multiplication of two numbers.
2. Design Webpage for employee registration form using all HTML controls and CSS.
3. Design web page for simple calculator By using class. Command name property. Button event.
4. Design web page of online shopping form which used textbox, label, buttons, and all type list controls.
5. Design Application for cross page posting.
6. Design This year calendar with all holidays in red color.
7. Design web page for image map by using Both method.
8. Design Advertisement web page.
9. Design web page which uses Multiview & View control. Wizard control. File upload control
10. Design web page for all validation control & validation Groups.
11. Create nested master pages.
12. Design web site which uses all site navigation Control.
13. Design web page which shows list of employees in selected dept.
14. Create XML & it's styles Sheet file.
15. Create Master Detail Form.
16. Create web page demonstrate insert, update, delete and select record.
17. Create web page demonstrate insert record and find sum of sal using stored procedure.
18. Design web page for grid view control.
19. Design web page which shows 10 events in calendar control.
20. Design web page which demonstrate wizard control.

## Sample Assignments on Advanced Java

1. Write a java socket programming in which client sends a text and server receives it.
2. Write a program to demonstrate URL class.
3. Write a program to demonstrate InetAddress class.
4. Write a program to demonstrate use of Datagram Socket.
5. Write a program to create Student registration form using Swing Component.
6. Write the following program using Swing component. An Election is conducted between 3 candidates. There are N number of voters. By clicking Next Voter Button textboxes and RadioButtons need to be cleared. By clicking Results, the votes obtained by each candidate and the winner candidate to be displayed in text area. Exit button should exit program.
7. Write a program for inserting data into table using PreparedStatement.
8. Write a program for updating data into table using PreparedStatement.
9. Write a program for deleting data into table using PreparedStatement.
10. Write a program to demonstrate callable statement.
11. Write a Servlet program to check that life cycle methods are called by web container.
12. Write a program to create simple servlet for displaying welcome message.
13. Write a program to create servlet for session management using cookies.
14. Write a program to create servlet for session management using Hidden Form Field.
15. Write a program to create servlet for session management using URL Rewriting.
16. Write a simple program of authenticating user using filter.
17. Write a simple program to demonstrate the use of request dispatcher.
18. Write a simple program to demonstrate the use of Send Redirect.
19. Write a JSP program to count number of visitors.
20. Write a program for communication between HTML & JSP.

## Sample Assignment on Advance Python

1. Write a program to draw different shapes
2. Write a program to develop GUI applications
3. Write a program to show database connectivity using MySQL to perform Insert, update and delete operations.
4. Write a program to implement Thread Synchronization.
5. Write a program to demonstrate use of XML file
6. Write a program to create simple Django app
7. Write a program to create simple Django project.
8. Write a program to create Django project which add, delete, update records.
9. Write windows application which demonstrate all layouts used in Tkinter.
10. Write windows application which demonstrate any 10 Tkinter controls.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

## Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

## Syllabus: English (Comp.)

## Name of the Course: B. A./B. Sc./ B.C.A. Part- III

## (Syllabus to be implemented from w.e.f. June 2021)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part – III**

## Name of the Course: Compulsory English

## Name of the Text: *Literary Mindscapes* (I & II )

**Semester- V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: BA/BSC Part III**

Name of the Paper**: Compulsory English**

## Literary Mindscapes (I & II )

**Semester: V & VI**

## Preamble:

Significance of English Language Skills in the days of technology is the need of the hour. Strengthening the basic language skills of English language acquired in the previous years of under graduation is essential. Oral and written communication skills along with the soft skills are required in this global scenario. The aspirants for jobs in private, public sectors, and PG Courses have to clear English proficiency test. This course will be instrumental in preparing the learners in these areas.

## Objectives of the Course:

- Strengthening comprehension skills
- Developing appreciation abilities for Literature
- Strengthening oral & written communication skills
- Galvanizing soft skills

## Course Outcome:

### By the end of the course the students will be able to

- Use oral and written English effectively
- Appreciate literary language
- Use English language in creative writing
- Apply English language skills in clearing competitive examinations

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the course**: BA/BSC Part III**

Name of the Paper**: Compulsory English**

**Literary Mindscapes – I**

**Semester: V**

CREDITS: 04 60 Lectures

**Unit No: I - Prose**

**1) The Gift of the Magi**: O' Henry
**2) The Homecoming**: Rabindranath Tagore

**Unit No: II - Poetry**

1) **The Solitary Reaper** William Wordsworth
**2) The Queen's Rival** Sarojini Naidu
**3) The Village School Master** Oliver Goldsmith
**4) The Road not Taken** Robert Frost

**Unit No: III - Grammar & Vocabulary**

1) Active & Passive Voice
2) Phrasal Verbs

**Unit No: IV - 21st Century Skills**
1) 21st Century Skills
2) Types of 21st Century Skills
3) Learning Skills (The 4 Cs)

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the course**: BA/BSC Part - III**

Name of the Paper**: Compulsory English**

**Literary Mindscapes – II**

**Semester: VI**

CREDITS: 04 60 LECTURES

**Unit No: I - Prose**

| | |
|---|---|
| **1) Growing Up** | Joyce Cary |
| **2) God Sees the Truth, but Waits** | Leo Tolstoy |

**Unit No: II - Poetry**

| | |
|---|---|
| **1) Sita** | Toru Dutt |
| **2) My Last Duchess** | Robert Browning |
| **3) Ode to Beauty** | John Keats |
| **4) Life** | Charlotte Bronte |

**Unit No: III - Grammar & Vocabulary**

1) Adverbials
2) Direct and Indirect speech

**Unit No: IV - Communication Skill**

1) Literacy Skills (IMT)
2) Life Skills (FLIPS)
3) Other Skills

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**
Name of the Paper: **Compulsory English**
Semester**: V & VI**
(2021-2022, 2022-2023, 2023-2024)
(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

| **Semester** | **Paper No.** | **Title of Paper** | **No. of Lectures** | **College Assessments (Marks)** | **University Assessments (Marks)** | **Total Marks** | **Credits** |
|---|---|---|---|---|---|---|---|
| V & VI | - | Compulsory English | 60 | 10 | 40 | 50 | 04 |

## Question Paper Pattern

**Name of the Course: BA/BSC Part III**
Name of the Paper**: Compulsory English**
**SEM- V & VI**

Q. **1 Rewrite the following sentences by choosing the correct alternative.** 08 Marks
(Poetry, Prose & Grammar)

**Q. 2 Write answers in short (any four out of six)** 12 Marks
(Prose & Poetry)

**Q. 3 Broad Question (any one)** 10 Marks
(Communication skills)

**Q. 4 Broad Question** 10 Marks
(Communication skills)

Equivalent subject for old syllabus (Compulsory Syllabus)

| Sr. No | Name of the Old Papers | Name of the New Papers |
|---|---|---|
| 1 | Compulsory English | Compulsory English |
| | | |
| | | |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part – III**

# Name of the Course: Introduction to Literary Criticism

**Paper No. – VII & XII**

**Semester – V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B. A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism**

**Semester – V & VI**

## Preamble:

It is a prime concern to inculcate the crucial skill of critical thinking among the students to lead them to a more balanced life. The ability to think critically and from multiple perspectives is very essential to make good evaluation and take the best decisions to lead a successful and satisfied life. The ability is quite needed for making the responsible good citizens. This paper aims at nourishing among the students the understanding of critical thinking: processes, terms, concepts, views, perspectives, approaches, theories, and practices. Keeping in view these basics, the paper includes the general understanding of the concept of criticism: meaning, nature, function, objectives, types, introductory history, and trends. So also, there is the inclusion of theories representing different eras as well as different perspectives.

## Objectives:

- To introduce the students to the basics of literary criticism.
- To give the students an overview of the critical practices from traditional criticism
- To acquaint the students with types of Literary Criticism
- To develop in them a critical perspective and ability to relate and compare various critical approaches.

## Course Outcomes:

By the end of the course the students will be able to:

- Understand the basics of literary criticism
- Trace the development of critical practices from traditional criticism
- Read and understand the representative theories/essays.
- Know the different critical terms/concepts/trends/movements/schools of Literary Criticism
- Look at a literary piece from different perspectives and relate them.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-VII)

**Semester – V**

CREDITS: 04 60 LECTURES

**Unit 1. Literary Criticism: Basics (Credit: 01) Lectures (15)**

Literary Criticism: Definitions/Meaning, Nature, Function, Qualifications of a good literary critic

**Unit 2. Classical Criticism (Credit: 01) Lectures (15)**

Aristotle: Theory of Imitation

**Unit 3. Neoclassical Literary Criticism (Credit: 01) Lectures (15)**

Samuel Johnson's 'Preface to Shakespeare'

**Unit 4. Types of Criticism (Introductory) (Credit: 01) Lectures (15)**

Aesthetic Criticism, Evaluative Criticism, ,Comparative Criticism, Historical Criticism, Descriptive Criticism

## References:


1. Abrams, M.H., Geoffery Galt Harpham, *Dictionary of Literary Terms and Literary Theory*, Cengage Learning India Private Limited. 2015.
2. Barry, Peter. *Beginning Theory: An Introduction to Literary and Cultural Theory,* Manchester University Press, 2002
3. Brooks, Cleanth and Wimsatt, *A Short History of Literary Criticism*, Univ of Chicago Pr. 1983.
4. Butcher, S. H.(Trans.) *The Poetics of Aristotle*. Macmilan. 1902
5. Cuddon, J. A. *Penguin Dictionary of Literary Terms and Literary* Theory.Penguin Books. 1999
6. Daiches, David. *Critical Approaches To Literature.* Orient Longman Limited, 1984
7. Fowler, Roger and Peter Childs. *The RoutledgeDictionary of Literary Terms.* Taylor and Francis. 2005
8. Guern, Wilfred L. *A Handbook of Critical Approaches to Literature*. Oxford University Press,1999.
9. Hudson, W.H. *An Introduction to the Study of Literature.* George G. Harrap and Co. Press.London.
10. Leech, G. N. *A Linguistic Guide to English Poetry*. Longman. 1969
11. Thorat, Ashok. *Kumar Iyer and et al. A Spectrum oif Literary Criticism*. Frank Bros. and Co. Ltd., 2001.
12. Wellek, Rene. and Austen Warren. *Theory of Literature*. Penguine Books Publicatin, 198

# Question Paper Pattern

Name of the Course**: B. A. Part III**
Name of the Paper: **Introduction to Literary Criticism**
**SEM- V**

**1. Rewrite the following sentences by choosing the correct alternative from given below.** 08 Marks

(Unit 2 Aristotle: Theory of Imitation/ Unit 3 Samuel Johnson's 'Preface to Shakespeare')

**2. Answer any Four of the following questions (Any Four out of Six)** 12 Marks
(Unit 4. Types of Criticism)

**3. Answer the following question. (One out of Two)** 10 Marks
(Unit 2 Aristotle: Theory of Imitation/ Unit 3 Samuel Johnson's 'Preface to Shakespeare')

**4. Answer the following Question (Only One)** 10 Marks
(Unit 1. Literary Criticism: Basics)

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-XII)

**Semester - VI**

## Preamble:

This paper aims at creating the awareness of the critical creed, multiple perspectives, theoretical bases and actual practice of relating theories, approaches, and perspectives to a literary piece. Further, the paper is an attempt to integrate theory with practice making the students able to think critically. With the application of theoretical knowledge in like-like situations, the students are expected to lead more balanced life. The introduction of wide range material is with the end to bridge the gap between lab and land and develop the practical knowledge and skill of the students. The inclusion of approaches, representative theories and practical criticism would enhance the capabilities of the students. The practical criticism included in the syllabus is with the aim to make students more intensive and practice-oriented.

## Objectives:

1. To introduce different approaches to the students.
2. To make the students aware of theoretical diversity.
3. To enable the students to understand different literary devices.

## Course Outcomes:

By the end of the course the students will be able:

1. To identify the features of different critical approaches.
2. To understand an essay from romantic criticism.
3. To understand an essay from $20^{th}$ century literary criticism
4. To understand literary devices.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the Course**: B.A. (English) Part–III**

Name of the Paper**: Introduction to Literary Criticism** (Paper-XII)

**Semester - VI**

CREDITS: 04 60 LECTURES

**Unit 1. Critical Approaches to Literature (Credit: 01) Lectures (15)**

I. Biographical Approach to Literature.

II. Psychological Approach to Literature.

III. Sociological Approach to Literature

**Unit 2. Romantic Criticism (Credit: 01)Lectures (15)**

William Wordsworth's 'Preface to Lyrical Ballads' (1802)

**Unit 3. Twentieth Century Criticism (Credit: 01) Lectures (15)**

T. S. Eliot's 'The Function of Criticism'

**Unit 4. Literary Devices/Terms (Credit: 01) Lectures (15)**

Theme, Tone, Mood, Imagery, Symbols, Alliteration, Onomatopoeia, Repetition, Rhyme, Antithesis, Hyperbole, Pun, Metonymy, Climax, Anticlimax, Conceit.

## References:


1. Barry, Peter Beginning Theory: *An Introduction to Literary and Cultural Theory*, Manchester University Press, 2002
2. Brooks, Cleanth and Robert Penn Warren. *Understanding Poetry*. Henry Holt 1938. rpt 1950.
3. Daiches, David. *Critical Approaches To Literature.* Orient Longman Limited, 1984
4. Richards, I. A. *Practical Criticism*. London, 1929
5. Eliot, T S. *Selected Essays*. Faber and Faber.1932
6. Eliot, T.S. *Selected Essays* 1917-1932, Harcourt,Brace and Company. 1932
7. Eliot, T. S. *Selected Essays*. Faber. 1999.
8. Evans, Robert. *Critical Approaches to Literature: Moral*. Salem Press. 2017.
9. Harpham, Geoffrey and Abrams M.H. *A Glossary of Literary Terms*. Cengage Learning, 2015.
10. Leech, G. N. *A Linguistic Guide to English Poetry*. Longman. 1969
11. Lennard, John. *The Poetry Handbook: A Guide to Reading Poetry for Pleasure and Practical Criticism*, Oxford Publication. 1996
12. Richards, I. A. *Practical Criticism*. London, 1929
13. Seturaman, V.S. and C.T.Indra, T. Sriraman, *Practical Criticism*, Macmillan Publishers India Limited, 1990.
14. Tyson, Lois. ENGL A337 *Critical Approaches to Literature*. Taylor & Francis. 2018.
15. Warren, Austin, and Wellek, René. *Theory of Literature*. Dalkey Archive Press.

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **Introduction to Literary Criticism**

Semester**: V & VI**

(2021-2022, 2022-2023, 2023-2024)

(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

| **Semester** | **Paper No.** | **Title of Paper** | **No. of Lectures** | **College Assessments (Marks)** | **University Assessments (Marks)** | **Total Marks** | **Credits** |
|---|---|---|---|---|---|---|---|
| V & VI | VII & XII | **Introduction to Literary Criticism** | 60 | 10 | 40 | 50 | 04 |

# Question Paper Pattern

Name of the Course**: B. A. Part III**

Name of the Paper: **Introduction to Literary Criticism (Paper-XII)**

**SEM- VI**

**Q. 1. Rewrite the following sentences by choosing the correct alternative from given below.**08 Marks

(Unit 2.William Wordsworth's 'Preface to Lyrical Ballads' (1802) and Unit 3. T. S. Eliot's 'The Function of Criticism')

**Q. 2. Answer any Four of the following questions (any four out of Six)** 12 Marks

Unit 4: Literary Devices/Terms

**Q. 3. Answer the following question. (One out of Two)** 10 Marks

A) Unit 2.William Wordsworth's 'Preface to Lyrical Ballads'

Or

B) Unit 3. T. S. Eliot's 'The Function of Criticism')

**Q. 4. Answer the following Question (Only One)**10 Marks

(Unit 1. Critical Approaches to Literature)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part – III**

# Name of the Paper: British Literature

**Paper No. – VIII & XIII**

**Semester – V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**
Name of the Paper: **British Literature**
**Semester V & VI**

## Preamble:

British literature is widely read and interpreted worldwide. It is necessary for the students to be introduced to different literary forms practiced by the writers in the British literary tradition.

## Objectives:

1. To acquaint the students with the major genres of British Literature.
2. To introduce various movements and major contribution to British literature.
3. To enhance literary, linguistic and aesthetic competence of the students.

## Course Outcomes:

By the end of the course the students will:

- Gain knowledge about stylistic strategies and diction of British literature.
- Be able to explore the creativity and the human experiences in fiction, poetry and drama.
- Be able to cultivate aesthetic and ethical values in life through literary texts.
- Gain knowledge of major trends and traditions of British literature.

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **British Literature (Paper-VIII)**

**Semester V**

CREDITS: 04 60 LECTURES

**Survey Topics:** Credit 01 Lectures 15

**1. Characteristics of Elizabethan Stage**

**2. Romance and Fantasy in English Novels**

**Poems:** Credit 01 Lectures 15

1. Edmund Spenser**:** ***Ice and Fire***
2. John Donne**:** ***Lovers' Infiniteness***
3. William Shakespeare**:** ***True Love***
4. John Milton**:** ***When I Consider How my Light is Spent***
5. George Herbert**:** ***The Flower***

**Drama:** Credit 01 Lectures 15

1. William Shakespeare: ***Antony and Cleopatra***

**Novel:** Credit 01 Lectures 15

1. Thomas Hardy: ***Two on a Tower***

## References:


1. Shakespeare, William, *Antony and Cleopatra*, Rupa & Co 2004.
2. Hardy, Thomas, *Two on a Tower*, Everyman India, 2010.
3. David Scott Kastan, ed. *The Oxford Encyclopedia of British Literature*, Oxford University Press, 2003.
4. Ford Boris, *The Pelican Guide to English Literature*, Penguin Books, 1955.
5. Green, David (Ed.), *The Winged Word* MacMillan Publishers India Pvt Ltd. 2016.
6. Herbert J. C. Grierson *A Critical History of English Poetry*, London, Hogarth Press, 1946.
7. Kettle, Arnold, *An Introduction of Novel*, Universal Book Stall, Vol 1 & 2.
8. Mundra J.N., and Mundra S.C. (1998), *A History of English Literature*, Vol. I,II, III.

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper: **British Literature (Paper-XIII)**

**Semester: VI**

CREDITS: 04 60 LECTURES

## Survey Topics: Credit 01 15 Lectures

**1. Victorian Poetry**

**2. Victorian Women Writers**

## Poems: Credit 01 15 Lectures

**1.** Robert Browning**:** ***Meeting at Night***

**2.** Tennyson: ***Come into the Garden, Maud***

**3.** Matthew Arnold**:** ***Shakespeare***

**4.** C.G. Rossetti: ***A Christmas Carol***

**5.** G.M. Hopkins**:** ***Spring***

## Drama: Credit 01 15 Lectures

1. John Osborne: ***Look Back in Anger***

## Novel: Credit 01 15 Lectures

1. Charlotte Bronte: ***The Professor***

## References:


1. Osborne, John. *Look Back in Anger,* Pearson Education. 2011.
2. Bronte, Charlotte. *The Professor* Wordsworth Editions Ltd, 2009.
3. David Scott Kastan, ed. *The Oxford Encyclopedia of British Literature*. Oxford University Press, 2003.
4. Ford Boris. *The Pelican Guide to English Literature*. Penguin Books, 1955.
5. Green, David (Ed.), *The Winged Word*. MacMillan Publishers India Pvt Ltd. 2016.
6. Herbert J. C. Grierson. *A Critical History of English Poetry*. London, Hogarth Press, 1946.
7. Kettle, Arnold. *An Introduction of Novel*. Universal Book Stall, Vol I & II.
8. Mundra J.N., and Mundra S.C. (1998). *A History of English Literature,* Vol. I,II, III.

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course**: B.A (English) Part–III**

Name of the Paper**: British Literature**

**Semester V & VI**

**(2021-2022, 2022-2023 & 2023-2024)**

**(CBCS Semester Pattern Syllabus *w.e.f.* June, 2021)**

| **Semester** | **Paper No.** | **Title of Paper** | **No. of Lectures** | **College Assessment** | **University Assessment** | **Total Marks** | **Credits** |
|---|---|---|---|---|---|---|---|
| V | VIII & XIII | British Literature | 60 | 10 | 40 | 50 | 04 |

## Question Paper Pattern

**Name of the Course: B. A. Part III**

Name of the Paper**: British Literature**

**SEM- V & VI**

**Que -1- Multiple Choice Questions.** (8 Marks)
(Poetry, Drama & Novel)

**Que- 2- Short Answer Type Question**. (12 Marks)
(2 Survey Topics & 4 Poetry)

**Que- 3- Broad Question with an internal option. (A or B).**
(Drama) (10 Marks)

**Que- 4- Broad Question.** (10 Marks)
(Novel)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part - III**

# Name of the Paper: Indian English Literature

**Paper No. – IX & XIV**

**Semester: V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**
Name of the Course**: B. A. (English) Part- III**
Name of the Paper: **Indian English Literature**
Semester: V & VI

## Preamble:-

In continuation with the study of early 20th century representative Indian English writers/writings covering major literary genres in B.A.Part-2, students are further to be acquainted with the development of Indian English Literature in late 20th century with focus on selected authors and texts .

## Objectives of the course:-

- To introduce to the students the socio-cultural and intellectual background of the post-independence Indian English Literature.
- To acquaint undergraduates with different literary genres as practised by representative Indian English writers in early post-independence period.
- To help students to understand, interpret variety of themes and styles as reflected in the prescribed texts.

## Course Outcomes:-

By the end of the course, students will –

• Understand gradual development of Indian English Literature in the latter half of the 20$^{th}$ century.
• Get acquainted with important themes & issues through study of texts prescribed.
• Get acquainted with Indian ethos as revealed through prescribed texts.
• Be able to interpret and analyse on their own & further nurture interest in the study of Indian literatures, especially Indian English Literature.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Name of the course**: B.A. Part III**

Name of the Paper**: Indian English Literature (Paper-IX)**

## Semester: V

CREDITS: 04 60 LECTURES

**(I) Survey Topics- (Credit-01) (Lectures-15)**

**1) Salient Features of Modern Indian English Poetry.** (With reference to the poems prescribed).

**2) Salient Features of Modern Indian English Drama**. (With reference to the translated Indian plays in English).

**(II) Poems Prescribed- (Credit-01) (Lectures-15)**

1) **Nissim Ezekiel**- Poet, Lover, Birdwatcher.

2) **Arun Kolatkar**- Between Jejuri and Railway Station.

3) **Shiv K. Kumar**- Letter from New York.

4) **Jayant Mahapatra**- Dawn at Puri.

5) **A. K. Mehrotra**- Letter to a Friend.

**(III) Drama-(Credit-01) (Lectures-15)**

**1. The Dread Departure** by Satish Alekar.

(Trans.by Gauri Deshpande) (Collected Plays of Satish Alekar) (OUP).

**(IV) Fiction- (Credit-01) (Lectures-15)**

**1. The Foreigner** - Arun Joshi. (Orient Paperbacks-2010)

## List of Reference Books-


1) K.R.Srinivas Iyengar-*Indian Writing in English*.(Sterling Pub.)

2) M.K.Naik-*A History of Indian English Literature*.(Sahitya Akademi New Delhi-1982)

3) Bruce King: *Three Indian Poets: Nissim Ezekiel, A.K.Ramanujan, Dom Moraes* (OUP-1991)

4) M.K.Naik-*Indian English Poetry: From Beginning to 2000.*

5) Meenakshi Mukherjee- *The Twice Born Fiction.* (Pencraft, New Delhi)

6) N.Bharucha & Vilas Sarang (edi)- *Indian English Fiction-1980-90- An Assessment.*

7) M.K.Bhatnagar (edi)- *The Novels of Arun Joshi-A Critical Study.* (Atlantic -January,2014)

8) Siddhartha Sharma- *Arun Joshi's Novels:A Critical Study*.(Atlantic Pub.)

9) A N.Dwivedi- *Studies in Contemporary English Drama.*

10) Kaustav Chakraborty- *Indian Drama in English*.

11) Natesan Sharada Iyer- *Musings on Indian Writing:Drama*. (Sarup & Sons, 2007).

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Course Name**: B. A. (English) - Part-III**

Paper Name**: Indian English Literature** (Paper No. XIV)

**Semester-VI**

CREDITS: 04 60 LECTURES

**(I) General/Survey Topics- (Credit-01) (Lectures-15)**

1**) Salient features of post-modern Indian English Poetry.** (With spl. reference to the poems prescribed).

2) **Salient features of post-modern Indian English Novel.** (With spl. reference to the Diasporic Indian English Novel).

**(II) Poems Prescribed- (Credit-01) (Lectures-15).**

1) **A. K. Ramanujan**- Looking for a Cousin on a Swing.

2) **Dilip Chitre**- Felling of Bunyan Tree

3) **Eunice De Souza-** Feeding the Poor at Christmas.

4) **Manohar Shetty**- Animal Planet.

5) **Mamta Kalia**- Tribute to Papa.

**(III)Drama- (Credit-01) (Lectures-15).**

1**. Nagamandala**- Girish Karnad. Updated Students' Version) (Oxford University Press-1999).

**(IV)Fiction- (Credit-01) (Lectures-15)**

**1. The Namesake** - Jhumpa Lahiri. (Mariner Books-Reprint-2004)

## List of Reference Books-


1) A.K.Mehrotra (Edi), *Ten Twentieth Century Indian English Poets.* (Oxford University Press-2001).

2) Menka, Shivdasani (Edi). *Anthology of Contemporary Indian Poetry* - (Big Bridge Press -2013).

3) Bruce, King. *Three Indian Poets Nissim Ezekiel, A.K.Ramanujan ,Dom Moraes.(*OUP-1991).

4) Kaustav, Chakraborty. *Indian Drama in English.*

5) Natesan Sharada Iyer, *Musings on Indian Writing: Drama*.(Sarup & Sons,2007)

6) Dr.S.S.Upase. *Power in Karnad's Plays.*

7) Nandkumar. *Indian English Drama : Study in Myths.*

8) N.Bharucha & Vilas Sarang (Edi). *Indian English Fiction 1980-90- An Assessment*.

9) Viney Kirpal (Edi). *The Post-modern Indian English Novel-Interrogating the 1980s & 1990s.*(Allied Publication -1996).

10) Nizara Hazarika, Johnson, Day (Edi.). *Contemporary Indian Women Writers in English: Critical Perspectives.* (Pencraft -2015)

11)Angshuman Kar (Edi.). *The Contemporary Indian Diaspora: Literary & Cultural Representation* (Rawat Pub. 2015).

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. (English) Part–III**

Name of the Paper: **Indian English Literature**

Semester**: V & VI**

(2021-2022, 2022-2023 & 2023-2024)

(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)

| **Semester** | **Paper No.** | **Title of Paper** | **No. of Lectures** | **College Assessment (Marks)** | **University Assessment (Marks)** | **Total Marks** | **Credits** |
|---|---|---|---|---|---|---|---|
| V & VI | IX&XIV | **Indian English Literature** | 60 | 10 | 40 | 50 | 04 |

# Question Paper Pattern

**Name of the Course: B. A. Part III**

Name of the Paper**: Indian English Literature**

**SEM- V & VI**

**Que-1- Multiple Choice Questions.** **(8 Marks)**
(Poetry, Drama & Fiction)

**Que-2- Short Answer Type Question**. (12 Marks)
(Survey Topics & Poetry)

**Que-3- Broad Question (A or B).** (10 Marks)
(Drama)

**Que-4- Broad Question.** **(10 Marks)**
(Novel)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part - III**

# Name of the Paper: Literatures in English

**Paper No. – X & XV**

**Semester: V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III (Semester V)**

Name of the Paper: **Literatures in English**

**Semester: V & VI**

## Preamble:

Many outstanding literary figures from different part of the world have been contributing and enriching literature. As English is the World Language, it is essential to introduce World Literature to B.A. III year students so as to get acquitted with these literary exponents and take an opportunity to study cultures, society, language and tradition depicted by them in their works.

## Objectives

• To develop a clear understanding of the key concepts of world literature

• To expose students to alternative literature produced in the world

• To provide an exposure to various writers from the entire world.

• To familiarize students with the different literary tradition of the world

• To help students understand and respond to literary texts of different time and period.

## Course Outcome:

By the end the course, the students will:

• Understand Literature from the world around.

• Understand the salient features of postcolonial fiction and absurd theatre.

• Be able to respond critically to world literatures in English.

• Get acquainted with different cultures across the world through literature.

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III (Semester V)**

Name of the Paper: **Literatures in English (Paper-X)**

**Semester: V**

CREDITS: 04 60 LECTURES

## I) General Topics: (Credit: 01) Lectures (15)

**1. Characteristic Features of the Russian Literature with reference to the Novel prescribed**

**2. Characteristic Features of the 20th Century Dramas with reference to the work prescribed.**

## II) Novel (Credit: 01) Lectures (15)

Leo Tolstoy**:** ***War and Peace*** (Fingerprint Publishing, 2015)

## III) Drama (Credit: 01) Lectures (15)

Tennessee Williams**:** ***The Streetcar Named Desire*** (Delhi Open Books, 2019)

## IV) Poems: (Credit: 01) Lectures (15)

1. Pablo Neruda: ***If You Forget Me.***
2. Amrita Pritam: ***The Will***
3. Louise Gluck: ***The Wild Iris***
4. Max Ehrmann: ***Desiderata***
5. Czeslaw Milosz: ***Account***
6. Edgar Allen Poe: ***A Dream within a Dream***
7. Li Po: ***Drinking Alone in the Moonlight***

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Literatures in English (Paper-XV)**

**Semester: VI**

CREDITS: 04 60 LECTURES

## I) Survey Topics: (Credit: 01) Lectures (15)

**1. Characteristic Features of Afro-American drama**

**2. A Psychological Thriller**

## II) Novel: (Credit: 01) Lectures (15)

Paula Hawkins: ***The Girl on the Train*** (Random House Publishing, 2015)

## III) Drama: (Credit: 01) Lectures (15)

Lorraine Hansberry: **A Raisin in the Sun.** (Vintage: Reprint, Reissue Edition,2004)

## IV) Short Story: **(**Credit: 01) Lectures (15)

1. William Somerset Maugham: ***The Luncheon***

2. Guy de Maupassant: ***The Necklace***

3. Sudha Murthy: ***How I Taught My Grandmother to Read***

4. Franz Kafka: ***Wedding Preparation in the Country***

5. Maxim Gorky: ***Twenty-Six Men and a Girl***

## List of References:


1. Andrews, W., F. Foster and T. Harris (eds).*The Oxford Companion to African American Literature*. Oxford, 1997.
2. Gilyard, K., and A. Wardi. *African American Literature*. Penguin, 2004.
3. Peterson, Carla (1995). *Doers of the Word: African-American Women Speakers and Writers in the North (1830–1880)*. New York: Oxford University Press.
4. Bennett, Michael Y. *The Cambridge Introduction to Theatre and Literature of the Absurd.* Cambridge: Cambridge University Press, 2015.
5. Esslin, Martin. Essay: "The Theatre of the Absurd". *The Tulane Drama Review*, Vol. 4, No. 4 (May, 1960), Publisher: MIT Press.
6. Terras, Victor (1985). *Handbook of Russian Literature*. New Haven, CT: Yale University Press
7. Bhabha, Homi K. (1994): *The Location of Culture.* Routledge, London and New York. Print.
8. Stone, Jonathan (2013). *Historical Dictionary of Russian Literature*. Rowman & Littlefield
9. Davies, Carole Boyce, and Anne Adams Graves. eds. *Ngambika: Studies of Women in African Literature*. Trenton: African World P, 1986.
10. Fanon, Frantz. *The Wretched of the Earth.* Trans. Constance Farrington. Middlesex: Penguin, 1967.
11. Gilbert, Helen (2001): *Introduction to Pantomime by Derek Walcott in): Postcolonial Anthology: An Anthology*. Routledge Chapman & Hall, London, 128-131. Print
12. Nayar, Pramod K. (2008): *Postcolonial Literature: An Introduction*. Pearson
    a. Longman, New Delhi, India. Print.

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper**: Literatures in English**

**Semester: V & VI**

**(2021-2022, 2022-2023 & 2023-2024)**

**(CBCS Semester Pattern Syllabus *w.e.f*. June, 2021)**

| Semester | Paper No | Title of the Paper | No. of Lectures (Theory) | College Assessment (Marks) | University Assessment (Marks) | Total Marks | Credits |
|---|---|---|---|---|---|---|---|
| V & VI | X & XV | Literatures in English | 60 | 10 | 40 | 50 | 100 |

## Question Paper Pattern

**Name of the Course: B. A. Part III**

Name of the Paper**: Literatures in English**

**SEM- V & VI**

**Que.1 Rewrite the following sentences by choosing the correct alternative.** 08 Marks

(Novel, Drama & Poetry)

**Que. 2 Write the answers in short. (Any Four out Six)** 12 Marks

(Survey Topics, Poems & Short Stories)

**Que.3 Broad question (any one)** 10 Marks

(Drama)

**Que. 4 Broad question.** 10 Marks

(Novel)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part - III**

# Name of the Paper: Introduction to the Structure and Function of Modern English

**Paper No. – XI & XVI**

**Semester: V & VI**

**With effect from June-2021-22, 2022-23 & 2023-24**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course**: B. A. (English) Part-III**

Name of the Paper**: Introduction to the Structure and Function of Modern English (Paper-XI)**

## Semester: V

## Preamble:

The paper, as its name suggests, introduces the students to various structures of modern English and their functions. It familiarizes them with the inter-relations of the units in a structure. It aims to help them frame and analyse structures and use appropriate words and expressions to convey various meanings.

## Objectives:

- To acquaint the students with the classification of words
- To acquaint them with the structures and functions of phrases, and enable them to analyse phrases
- To acquaint them with the elements of clause
- To acquaint them with the active and passive clause patterns
- To introduce them to a few communicative concepts

## Course Outcomes:

By the end of the course, the students will be able to:

- Identify the class of words
- Know the structure and function(s) of phrases and analyse them
- Identify clause elements
- Construct sentences using basic clause patterns
- Use appropriate words and expressions to communicate the prescribed concepts

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

**(Paper-XI)**

**Semester: V**

CREDITS: 04 60 LECTURES

**Teaching Components:**

**1. Unit No: 1: Words** **(Credit: 01)** **(Lectures: 15)**

1.1 Open and closed word classes

1.2 Analysis of open and closed word classes

**2. Unit No. 2: Phrases** **(Credit: 01)** **(Lectures: 15)**

2.1 Main Phrase and Subordinate Phrase

2.2 Classes of Phrase: NP, PP, GP, AjP, AvP and VP.

2.3 Analysis of Phrases

**3. Unit No. 3 Clauses** **(Credit: 01)** **(Lectures: 15)**

3.1 Elements of Clause

3.2 Classification of Clauses—Subordinate and Main Clauses

3.3 Subordinate Clause and its types

3.4 Finite (Tensed), Non-finite Tenseless and Verbless Subordinate Clauses

3.5 Types of Main Clause: Declarative Clause, Interrogative Clause, and Imperative Clauses

3.6 Active and passive Clauses

3.7 Basic Clause Patterns

**4. Unit No. 4: Communicative Concepts** **(Credit: 01)** **(Lectures: 15)**

4.1 Statements, Questions and Responses

4.2 Denial and Affirmation

4.3 Agreement and Disagreement

4.4 Degrees of Likelihood

**Books Recommended:**

1. Leech, Geoffrey, Margaret Deuchar and Robert Hoogenraad. *English Grammar for Today*. London: Palgrave, 1982.
2. Quirk, Randolph and Sidney Greenbaum. *A University Grammar of English*. Hong Kong: Longman, 1993.
3. Greenbaum, Sidney and Randolph Quirk. *A Student's Grammar of the English Language*. New Delhi: Pearson Education, 2009.
4. Greenbaum, Sidney. *Oxford English Grammar*. New Delhi: OUP, 2009.
5. Leech, Geoffrey, and Jan Svartvik. *A Communicative Grammar of English*. Delhi: Longman, 2002.

# Question Paper Pattern

Name of the Course**: B. A. Part III**

Name of the Paper**: Introduction to the Structure and Function of Modern English**

**Semester: V (Paper No. XI)**

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Time: Marks: 40

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks

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**Q.1. Choose the correct alternative.** 10 Marks

(Ten multiple type questions will be set on all the topics)

**Q.2. Answer any five of the following in brief.** 10 Marks

(Six questions will be set on the topic *Words*)

**Q.3. A) Answer any two of the following questions in brief.** 06 Marks

(Three questions will be set on the topic *Communicative Concepts*)

**Q.3.B) Answer any two of the following in brief.** 04 Marks

(Three questions will be set on the topic *Phrases*)

**Q. 4. Answer *any one* of the following questions.** 10 Marks

(Two broad answer type questions will be set on the topic *Clauses*)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

**(Paper-XVI)**

**Semester: VI**

**(Credits: 04) (Total lectures: 60)**

## Preamble:

The paper, as its name suggests, introduces the students to various structures of modern English and their functions. It familiarizes them with the inter-relations of the units in a structure. Moreover, it makes them realize how language varies according to the medium in which it is put, the relationship or the relative distance between the addresser and the addressee(s), and the function it fulfils in communication. It aims to help them use correct structures, and use appropriate words and expressions to convey various meanings.

## Objectives:

- To acquaint the students with the classification of sentence
- To acquaint them with the processes of subordination and coordination
- To acquaint them with the structures and functions of subordinate clauses
- To introduce them to the basic and derived structures
- To introduce them to discourse analysis with reference to mode, tenor and domain
- To introduce them to a few more communicative concepts other than the ones prescribed in the preceding semester

## Course Outcomes:

By the end of the course the students will be able to:

- Identify the simple and complex sentences
- Know the difference between subordination and coordination
- Derive structures from the basic ones
- Analyse a discourse with reference to its mode, tenor and domain
- Use appropriate words and expressions to communicate.

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Introduction to the Structure and Function of Modern English**

**(Paper-XVI)**

**Semester: VI**

CREDITS: 04 60 LECTURES

**Teaching Components:**

## Unit No.1: Subordination and Coordination **(Credit: 01) (Lectures: 15)**

1.1 Kinds of Sentences: Simple and Complex
1.2 Subordinate Clauses (SCls)
1.2.1 Structure of Subordinate Clauses
1.2.2 Functions of Subordinate Clauses
1.3 Classification of Subordinate Clauses: Finite (Tensed) and Non-finite (Tenseless)
1.4 Kinds of Subordinate Clauses: Noun Clauses, Adverbial Clauses, Relative Clauses, Comparative Clauses, and Prepositional Clauses
1.5 Subordination: Direct and Indirect
1.6 Coordination

## Unit No. 2: Basic and Derived Structures **(Credit: 01) (Lectures: 15)**

2.1 Basic and Derived Structures
2.2 'Missing' Elements
2.3 Split Constituents
2.4 Double Analysis
2.5 Style and Structure-changing Rules

## Unit No. 3: Discourse Analysis **(Credit: 01) (Lectures: 15)**

3.1 Dimensions of Discourse: Mode, Tenor, and Domain
3.2 Mode: Speech and Writing
3.2.1 Speech and Writing: Which Comes First?
3.2.2 Functions of Writing and Speech
3.2.3 The Form of Speech and Writing
3.2.4 Linguistic Characteristics of Speech and Writing
3.2.5 An analysis of Spoken and Written Discourse
3.3 Tenor
3.3.1 Tenor and Discourse
3.4 Domain
3.4.1 Domain and Discourse

## Unit No. 4: Communicative Concepts **(Credit: 01) (Lectures: 15)**

4.1 Describing Emotions
4.2 Friendly Communications
4.3 Permission and Obligation
4.4 Influencing People

**Books Recommended:**

1. Leech, Geoffrey, Margaret Deuchar and Robert Hoogenraad. *English Grammar for Today*. London: Palgrave, 1982.
2. Quirk, Randolph and Sidney Greenbaum. *A University Grammar of English*. Hong Kong: Longman, 1993.
3. Greenbaum, Sidney and Randolph Quirk. *A Student's Grammar of the English Language*. New Delhi: Pearson Education, 2009.
4. Greenbaum, Sidney. *Oxford English Grammar*. New Delhi: OUP, 2009.
5. Leech, Geoffrey, and Jan Svartvik. *A Communicative Grammar of English*. Delhi: Longman, 2002.

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Name of the Course: **B.A (English) Part–III**

Name of the Paper**: Introduction to the Structure and Function of Modern English**

**Semester V & VI**

**(2021-2022, 2022-2023 & 2023-2024)**

**(CBCS Semester Pattern Syllabus *w. e. f.* June, 2021)**

| Sem. | P-No | Title of the Paper | No. of Lectures | C A Marks | UA marks | Total marks | Credits |
|---|---|---|---|---|---|---|---|
| VI | XI & XVI | Introduction to the Structure and Function of Modern English | 60 | 10 | 40 | 50 | 04 |

C A: College Assessment
U A: University Assessment

# Question Paper Pattern

Name of the Course**: B. A. Part III**

**Paper No. XVI: Introduction to the Structure and Function of Modern English**

**Semester: VI**

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Time: Marks: 40

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks

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**Q.1. Choose the correct alternative.** 10 Marks

(Ten multiple type questions will be set on all the topics)

**Q.2. Answer any five of the following in brief.** 10 Marks

(Six questions will be set on the topic *Basic and Derived Structures)*)

**Q.3. A) Answer any two of the following questions in brief.** 06 Marks

(Three questions will be set on the topic *Communicative Concepts*)

**Q.3. B) Give form and function labels to any two of the underlined clauses in the given sentences.** 04 Marks

(Three questions will be set on the topic *Subordination and Coordination*)

**Q.4. Analyse any one of the given discourses with reference to its mode, tenor and domain supporting with at least two examples of each from it.** 10 Marks

(Two examples of discourse – one written and the other spoken based on the topic *Discourse Analysis* will be given.)

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

**Name of the Faculty: Humanities**

**Name of the Course: B. A. (English) Part - III**

# Name of the Paper: Content Writing and Editing in English Language

## (Skill Development Course)

**With effect from June-2021-22, 2022-23 & 2023-24**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language**

**(Skill Development Course)**

## Preamble:

In this course, the students will study how to write and edit content in English. The course will examine different types of content writing. Consistent, engaging, and high-quality **content** impacts the audience more than any other technique. **Content writing** allows your brand to create cohesive pieces of information. Consistency, especially in brand messaging, is one of the significant factors to determine the growth and success of your business. An editor will find himself planning, coordinating and editing material for publication at newspaper, magazine, publishing house or other organization This course offers writing and editing skills to train "aspiring-content writers and editors.

## Objectives of the Course:

1. The course aims to inculcate content writing and content editing skills among the students.
2. This course can also be beneficial to the existing content writers in honing their skills.

## Course Outcome:

1. Content writing is considered a highly skilled area and presents opportunity for a full time/part time career.
2. Students will be able to write and edit content.

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language (Skill Development Course)**

## [Credits:04 Theory-(45), Practical-(15)]

**Total Theory Lectures-(45)** **Total Credits – (04)**

**Unit No: 1 Introduction to Content Writing and Editing** **(**Credit: 01) **(15)**

**Unit No: 2 Structuring and Writing Quality Content** (Credit: 01) **(15)**

**Unit No: 3 Copy Writing, Sales, Advertising and Promotion.** (Credit: 01) **(15)**

**Unit No: 4 Digital Content Writing** (Credit: 01) **(15)**

## Course Structure:

| Semester | Paper No. | Title of Paper | No. of Lectures | College Assessments (Marks) | University Assessments (Marks) | Total Marks | Credits |
|---|---|---|---|---|---|---|---|
| | | CONTENT WRITING AND EDITING IN ENGLISH | 60 | 20 | 80 | 100 | 04 |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

Name of the Course: **B. A. –III**

Name of the Paper: **Content Writing and Editing in English Language**

**(Skill Development Course)**

**Unit: I Introduction to Content Writing and Editing**

- Origin and need of content writing
- Career in content writing
- Types of content writings
- The Concept of Content Marketing
- Difference between Academic and Content Writing.

**Unit: II Structuring and Writing Quality Content**

- Brainstorming and Collection of Material
- Proof Reading Techniques
- How to Structure a Book and ensure Content Quality?
- Documentation and Formatting

**Unit: III Copy Writing, Sales, Advertising and Promotion.**

- Writing Newsletters, Product Descriptions and Press Releases
- Importance of Page Layout and Text Outline
- Effective Writing Techniques
- Writing Articles
- Mistakes to Avoid

**Unit**: **IV** – **Digital Content Writing**

- Video scripts
- Email newsletters
- Keynote speeches
- Social media posts
- Podcast titles
- Web page copy
- YouTube video descriptions
- Blog

## List of References:

1. A. Z. Gill, Content Writing: A helpful Guide,

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: ZOOLOGY

## Name of the Course: B.Sc. II (Sem–III& IV)

**( Draft Syllabus to be implemented from w.e.f. June 2020)**

**P.A.H.Solapur University, Solapur , Faculty of Science**
**Choice Based Credit System (CBCS)**
**B.Sc.-II Zoology**
**( 2020-2021 : W.e.f. June 2020)**

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## Background of Curriculum:

In accordance with the UGCs reference to standardize curricula at the national level and bring a match across all the Indian Universities, an attempt has been made to follow the pattern given in the UGCs Undergraduate Template.

Zoology deals with the study of animal kingdom specially the structural diversity, biology, embryology, evolution, habits and distribution of animals, both living and extinct. As it covers a fascinating range of topics, the modern zoologists need to have insight into many disciplines. The learning outcomes-based curriculum framework for a B.Sc. degree in Zoology is designed to cater to the needs of students in view of the evolving nature of animal science as a subject. The framework is expected to assist in the maintenance of the standard of Zoology degrees/programmes across the country by reviewing and revising a broad framework of agreed expected graduate attributes, qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework, however, does not seek to bring about uniformity in syllabi for a programme of study in Zoology, or in teaching learning process and learning assessment procedures. Instead, the framework is intended to allow for flexibility and innovation in programme design and syllabi development, teaching learning process, assessment of student learning levels. A comprehensive knowledge of structure-function relationship at the level of gene, genome, cell, tissue, organ, and systems, through development would further add to the knowledge base and the learning outcome in terms of editing of genes and genomes for industrial application and research purposes.

## Learning Outcomes based approach to Curriculum Planning:

The courses should be delivered in terms of concepts, mechanisms, biological designs & functions and evolutionary significance cutting across organisms at B.Sc. level. These courses should be studied by students of all branches of biology. Both chalk and board, and PowerPoint presentations can be used for teaching the course. The students should do the dissertation/ project work under practical of different courses, wherever possible.

The students are expected to learn the courses with excitements of biology along with the universal molecular mechanisms of biological designs and their functions. They should be able to appreciate shifting their orientation of learning from a descriptive explanation of biology to a unique style of learning through graphic designs and quantitative parameters to realize how contributions from research and innovation have made the subjects modern, interdisciplinary and applied and laid the foundations of Zoology, Animal Sciences, Life Sciences, Molecular Biology and Biotechnology. These courses and their practical exercises will help the students to apply their knowledge in future course of their career development in higher education and research. In addition, they may get interested to look for engagements in industry and commercial activities employing Life Sciences, Molecular Biology and Biotechnology. They may also be interested in entrepreneurship and start some small business based on their interest and experience.

**Graduate Attributes in Zoology:**

- Disciplinary knowledge and skills: Capable of demonstrating (i) comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields (ii) ability to use modern instrumentation for advanced genomic and proteomic technology.

- Skilled communicator: Ability to impart complex technical knowledge relating to Zoology in a clear and concise manner in writing and oral skills.

- Critical thinker and problem solver: Ability to have critical thinking and efficient problem solving skills in the basic areas of Zoology

- Sense of inquiry: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.

- Team player/worker: Capable of working effectively in diverse teams in both classroom, laboratory and in industry and field-based situations.

- Skilled project manager: Capable of identifying/mobilizing appropriate resources required for a project, and manage a project to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.

- Digitally literate: Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate location and biological annotation genes of different species.

- Ethical awareness/reasoning: Capable of conducting their work with honesty and precision thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues. Research ethics committee expects them to declare any type of conflict of interest that may affect the research. Any plan to withhold information from researchers should be properly explained with justification in the application for ethical approval.

- Lifelong learners: Capable of self-paced and self-directed learning aimed at personal development and for improving knowledge/skill development and reskilling

**Choice Based Credit System:** With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Solapur University has implemented Choice Based Credit System (CBCS) at Undergraduate level. The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations.

• Outline of Choice Based Credit System:

1. *Core Course:* A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. *Elective Course:* Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective.

3. *Ability Enhancement Courses (AEC):* The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement; (i) Environmental Science and (ii) English/MIL Communication. These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

• Credit: Credit is a numerical value that indicates students work load (Lectures, Lab work, Seminar, Tutorials, Field work etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into credits. Moreover, the grading system of evaluation is introduced for B.Sc. course wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 20 marks and University Evaluation for 80 marks.

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**
**Faculty of Science & Technology**
**Choice Based Credit System (CBCS): (w.e.f.2020-21): Draft Structure for B. Sc-II**

| **Subject/ Core Course** | **Name and Type of the Paper** | | **No. of papers/ Practical** | **Hrs/week** | | | **Total Marks Per Paper** | **UA** | **CA** | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Type** | **Name** | | **L** | **T** | **P** | | | | |
| Class : | B.Sc.- II : semester-III | | | | | | | | | |
| Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject | | C-5 | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-6 | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | **C-7 (Zoology)** | **Paper-V: Cell Biology** | **3.0** | **--** | **--** | **50** | **40** | **10** | **4.0** |
| | | | **Paper-VI: Principles of Ecology** | **3.0** | **--** | **--** | **50** | **40** | **10** | |
| | | SEC-1 | | | | | | | | |
| | | GE-3 | | | | | | | | |
| Grand Total | | | | 18 | -- | -- | 300 | 240 | 60 | 12 |
| Class : | B.Sc.- II Semester – IV | | | | | | | | | |
| Core (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other will be Elective | | C-8 | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-9 | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | **C-10 (Zoology)** | **Paper-VII Fundamentals of Biochemistry** | **3.0** | **--** | **--** | **50** | **40** | **10** | **4.0** |
| | | | **Paper-VIII Physiology-Control & Coordination** | **3.0** | **--** | **--** | **50** | **40** | **10** | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Subject | | | | | | | | | |
| | SEC-2 | | | | | | | | |
| | GE-4 | | | | | | | | |
| | Environmental Studies | | 3.0 | -- | -- | 50 | 40 | 10 | NC |
| Total (Theory) | | | 21 | -- | -- | 350 | 280 | 70 | 12 |
| Practical | C-5 & C-8 | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | C-6 & C-9 | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | **C-7 & C-10 (Zoology)** | **Pr. I: (Cell Biology & Principles of Ecology) & Pr. II: (Fundamentals of Biochemistry & Physiology-Control & Coordination)** | **--** | **--** | **8** | **100** | **80** | **20** | **4.0** |
| | GE-3 & GE-4 | | | | | | | | |
| Total (Practical) | | | | | 24 | 300 | 240 | 60 | 12 |
| Grand Total | | | 39 | | 24 | 950 | 760 | 190 | 36 |

*Core Subjects
Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology
Core Subjects- (Additional)-Geochemistry/Biochemistry/Meteorology/Plant Protection

**Summary of the Structure of B.Sc. Programme as per CBCS pattern**

| **Class** | **Semester** | **Marks-Theory** | **Credits-Theory** | **Marks-Practical** | **Credits-Practicals** | **Total – credits** |
|---|---|---|---|---|---|---|
| B.Sc.-II | III | 300 | 12 | -- | -- | 12 |
| | IV | 350 | 12 | 300 | 12 | 24 |
| Total | | 650 | 24 | 300 | 12 | 36 |

B.Sc. Programme :
Total Marks : Theory + Practical's = 650 +300 =950
Credits : Theory + Practical's = 12 + 24 = 36
Numbers of Papers Theory: Ability Enhancement Course (AECC) : 00
Theory: Discipline Specific Elective Paper (DSE) : 00
Theory: CC : 06
Skill Enhancement Courses : 00
GE : 00
Total : Theory Papers :

: Practical Papers :

Abbreviations:

L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

**PAH SOLAPUR UNIVERSITY, SOLAPUR**
**Faculty of Science**
**Choice Based Credit System (CBCS)**
**(W.e.f. 2020-21)**

• Title of the Course: B.Sc. Part-II

• Subject: Zoology

• **Introduction**: This course provides a broad overview of Zoology and to produces expert hands that would have sufficient knowledge and expertise to solve the urgent problems of the region by using Zoology. The course structure is basic science centric where students learn core science and are taught necessary fundamental subject for that purpose.

• **Objectives of the course: The objectives of B. Sc. Zoology course are:**
To provide an intensive and in depth learning to the students in field of Zoology. Beyond simulating, learning, understanding the techniques, the course also addresses the underlying recurring problems of disciplines in today scientific and changing world. To develop awareness & knowledge of different organization requirement and subject knowledge through varied branches and research methodology in students. To train the students to take up wide variety of roles like researchers, scientists, consultants, entrepreneurs, academicians, industry leaders and policy.

- **Course outcome and Advantages:** Zoology has tremendous job potential. The successful students will be able to establish research organizations with the help of agriculture, environment protection and also their own industry for transgenic animals, clinical pathology, genetic counseling, human karyotyping etc. Scientific Research Organizations. Universities in India & aboard.

• Medium of Instruction: English
• Syllabus Structure:
• The University follows semester system.
• An academic year shall consist of two semesters.
• B.Sc. Part-II Zoology shall consist of two semesters: Semester III and Semester IV

**In semester III**: there will be two DSC papers having paper V and paper VI of 100 marks. There will a **Compulsory paper on "Ability Enhancement Compulsory Course (AECC )" on** Environmental Studies

**In Semester IV**: there will be two DSC papers having paper VII and paper VIII of 100 marks.

The scheme of evaluation of performance of candidates shall be based on **University Assessment (UA**) as well as **College Internal Assessment (CA)** as given below.

For B.Sc.Part-II Zoology Sem III & IV the "internal assessment" will be based on Internal tests, Home assignment, Tutorials, Open Book Examination, Seminars, Group discussion, Brain storming sessions etc. as given below.

- **Practical course examination** is of 100 marks shall be conducted at the end of semester II. The

practical examination of 100 marks shall also consist of **80 marks for University practical assessment** and **20 marks for college internal assessment (CA)**.

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• **Scheme of Evaluation**: As per the norms of the grading system of evaluation, out of 100 marks, the candidate has to appear for college internal assessment of 20 marks and external evaluation (University assessment) of 80 marks.

**Semester – III: Theory: (100 marks): Comprising DSC-**

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper V and paper VI of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper V and paper VI of 10 marks each)

c) **Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on** Environmental Studies

**Internal test**- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.

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**Semester – IV: Theory: (100 marks): Comprising DSC-**

a) University Examination (UA) (80 marks): No. of theory papers: 2 (paper VII and paper VIII of 40 marks each)

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper VII and paper VIII of 10 marks each)

**Internal test**- Home assignment / tutorials / seminars / viva/ group discussion/ outreach programs.
**Practical Examination: (100 marks)**
University Examination (80 marks): No. of practicals': 02

Practical-I: Based on papers V & VI : (40 UA + 10 CA)
Practical-II: Based on papers VII & VIII : (40 UA + 10 CA)

Internal Continuous Assessment: (20 marks): Practical-I (10) + Practical-II (10)

(a) Internal practical test and
(b) Viva/group discussion/model or chart/attitude/attendance/overall behavior
(c) University practical examination of 80 marks (Practical I & II for two separate days) will be conducted at the end of semester IV

**Passing Standard:**

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secure less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper and shall be required to reappear for respective paper. A student who failed in University Examination (theory) and passed in internal assessment of a same paper shall be given FC Grade.

Such student will have to reappear for University Examination only. A student who fails in internal assessment and passed in University examination (theory) shall be given FR Grade. Such student will have to reappear for both University examination as well as internal assessment. In case of Annual pattern/old semester pattern students/candidates from the mark scheme the candidates shall appear for the same 70 marks of external examination and his performance shall be scaled to 100 marks.

**• ATKT:**

Candidate passed in all papers, except 5 (five) papers combined together of semester I and II of B.Sc. Part-I Zoology examination shall be permitted to enter upon the course of Semester III of B.Sc. Part-II Zoology

**B.Sc .II Semester-III & IV, ZOOLOGY**

Choice Based Credit System (CBCS) Structure (2020-21)

**Semester- III (Theory)**

| Paper | Title | Marks |
|---|---|---|
| V | Cell Biology | 50<br>(40- UA and 10-CA) |
| VI | Principles of Ecology | 50<br>(40- UA and 10-CA) |

**Semester- IV (Theory)**

| Paper | Title | Marks |
|---|---|---|
| VII | Fundamentals of Biochemistry | 50<br>(40- UA and 10-CA) |
| VIII | Physiology-Control & Coordination | 50<br>(40- UA and 10-CA) |

**PRACTICALS**

| PRACTICAL | Title | Marks |
|---|---|---|
| I | Cell Biology<br>&<br>Principles of Ecology | 50<br>(40- UA and 10-CA) |
| II | Fundamentals of Biochemistry &<br>Physiology Control & Coordination | 50<br>(40- UA and 10-CA) |
| | **Total Marks** | 100 (80-UA + 20-CA) |

**PAH SOLAPUR UNIVERSITY, SOLAPUR**
**Choice Based Credit System (CBCS)**
**Zoology**

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**Paper-V**

**CELL BIOLOGY: THEORY (Credits-02 & contact hours-30)**

**Unit 1: Overview of Cells** **02**
Prokaryotic and Eukaryotic cells, Virus, Viroids

**Unit 2: Plasma Membrane** **03**
Singer & Nicholson's model of plasma membrane. Transport across membranes: An overview of active and passive transport

**Unit 3: Endomembrane System** **06**
Structure and Functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes

**Unit 4: Mitochondria** **04**
Mitochondria: Ultrastructure, Semi-autonomous nature, Endosymbiotic hypothesis Mitochondrial Respiratory Chain, functions.

**Unit 5: Cytoskeleton** **04**
Structure and Functions: Microtubules, Microfilaments

**Unit 6: Nucleus** **05**
Structure and functions of Nucleus, Nuclear envelope, Nuclear pore complex, Nucleolus, Chromatin: Euchromatin, Hetrochromatin and nucleosome

**Unit 7: Cell Division** **04**
Cell cycle, Mitosis and Meiosis

**Unit 8: Cell Signaling** **02**

- Types of cell signaling , Brief idea of G-Protein Coupled Receptor (GPCR) and Role of secondary messengers (cAMP)

**SUGGESTED READINGS**


1) Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
2) De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
3) Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
4) Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
5) Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008).

Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.

**Learning outcomes : Students will come to know about:**

- Cellular architecture & their functions at organismic level
- This knowledge will help students in future to explore areas like: oncology, medical diagnostics and treatment
- Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved.
- Acquire the detailed knowledge of different pathways related to cell signaling and apoptosis thus enabling them to understand the anomalies in cancer.
- Develop an understanding how cells work in healthy and diseased states and to give a 'health forecast' by analyzing the genetic database and cell information.
- Get new avenues of joining research in areas such as genetic engineering of cells, cloning, vaccines development, human fertility programme, organ transplant, etc.

## Paper-VI

## PRINCIPLES OF ECOLOGY: THEORY (Credits-02 & contact hours-30)

**Unit 1:** **Introduction to Ecology** **02**

History of ecology, Autecology and synecology

**Unit 2:** **Population Ecology** **05**

**Brief idea about attributes of population:** Density, natality, mortality, life tables, fecundity tables, survivorship curves.

**Unit 3:** **Animal Associations- Brief idea and definitions** **05**

- Intraspecifc associations: Parental care in fishes, groupism and social behavior
- Interspecific associations: commensalism, mutualism, predation and parasitism

**Unit 4:** **Abiotic Factors** **03**

**Introduction & Effects on animals:** Temperature, light, water, water hardness, humidity, soil, oxygen and carbon dioxide.

**Unit 5:** **Community** **04**

Community characteristics: species richness, dominance, diversity indices, abundance.

**Unit 6:** **Ecosystem** **05**

**General characteristics & faunal adaptations in:**

- Aquatic (freshwater ecosystem: lotic and lentic) &
- Terrestrial (grassland and desert ecosystem).

**Unit 7:** **Food chain:** **04**

**Pond ecosystem:** with reference to food chain, ecological pyramid, energy flow and ecological succession

**Unit 8** **Applied Ecology** **02**

Brief idea of: Biodiversity hot-spots and sacred groves in India with examples

**SUGGESTED READINGS:**


1) Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
2) Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3) Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
4) Robert Leo Smith Ecology and field biology Harper and Row publisher
5) Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres

**Learning Outcomes (LO): Students will come to know about**

- Ecological principles & applications that govern the planet Earth
- This knowledge will help students in future to explore areas like: biodiversity, conservation biology, forestry & natural resource management
- Know the evolutionary and functional basis of animal ecology.
- Understand what makes the scientific study of animal ecology a crucial and exciting endeavor.
- Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.
- Analyze a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.
- Solve the environmental problems involving interaction of humans and natural systems at local or global level.

# Semester-IV

**B.Sc.-II Zoology (CBCS): Semester-IV**

**PAPER-VII: FUNDAMENTALS OF BIOCHEMISTRY**

**THEORY (CREDITS 2; Contact Hours-30)**

**Unit 1:** **Carbohydrates** **(04)**
Structure and biological Significance of: Monosaccharides, Disaccharides, Polysaccharides and Glycoconjugates

**Unit 2:** **Lipids** **(04)**
Structure and biological Significance of: Physiologically important of saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Glycolipids, Steroids

**Unit 3:** **Amino Acids** **(03)**
Amino acids: Structure, Classification and General Properties of α-amino acids;

**Unit 4:** **Proteins:**
Levels of organization in proteins (primary, secondary, tertiary & quaternary); Simple and conjugate proteins with examples **(02)**

**Unit- 5:** **Immunoglobulins:**
Basic Structure, Classes and biological significance **(02)**

**Unit 6:** **Nucleic Acids** **(04)**
Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids: Base pairing, Denaturation and Renaturation of DNA; Types of DNA and RNA.

**Unit 7:** **Central Dogma**
Basic concepts of replication, transcription and translation in prokaryotes **(04)**

**Unit 8:** **Enzymes** **(07)**
Nomenclature and classification; Co-factors; Properties of enzymes; Mechanism of enzyme action; Factors affecting enzyme actions; Enzyme inhibition, Isozymes

**Learning Outcome:**

After successfully completing this course, the students will be able to:

- Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids.
- Understand the structure and function of immunoglobulins.
- Understand the concept of enzyme, its mechanism of action and regulation.
- Understand the process of DNA replication, transcription and translation.
- Learn the preparation of models of peptides and nucleotides.

- Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.
- Learn measurement of enzyme activity and its kinetics.

## PAPER-VIII
## ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS

**THEORY (CREDITS 2; Contact Hours-30)**

**Unit 1: Tissues (04)**

Structure, location, classification and functions of: epithelial tissue, connective tissue, muscular tissue and nervous tissue :

Blood –Types of blood cells( RBC,WBC ,Platelets , Plasma) , functions of blood

**Unit 2: Histology of following mammalian organs: (04)**

i) Tooth ii) Salivary gland iii) Stomach iv) IIeum
v) Liver vi) Pancreas vii) Kidney viii) Testis ix) Ovary

**Unit 3: Nervous System (04)**

Ultastructure of neuron, resting membrane potential, origin of action potential and its propagation across the nerve fibers; Structure of Synapse and Synaptic transmission,

**Unit 4: Muscle (03)**

Types of muscles (smooth, Striated, cardiac) and Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction.

**Unit 5: Reproductive Physiology (03)**

Pituitary gland & its hormones, Sex hormones (male & female)

**Unit 6: Reproductive Cycle (04)**

Oestrous and Menstrual cycle, Hormonal control of pregnancy, parturition and lactation; Contraception methods: Physical, oral contraceptives pills, IUD, surgical methods

**Unit 7: In-vitro Fertilization (02)**

Technique of IVF and its applications

**Unit 8: Endocrine System (06)**

Histology, hormonal secretions & their functions and disorders of following endocrine glands- Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal.

*Note: With reference to mammals.

**Learning outcomes:**

After successfully completing this course, the students will be able to:

- Acquire knowledge of the coordinated physiological functioning
- Realize that very physiological mechanisms are used in very diverse organisms.
- Understand how cells, tissues, and organisms function at different levels.

- Develop an understanding of the related disciplines, such as cell biology, neurophysiology, pharmacology, biochemistry etc
- Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.
- Undertake research in any aspect of animal physiology in future.

**REFERENCES:**

**CELL BIOLOGY:**


- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley and Sons. Inc.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA.
- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). The World of the Cell. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell, V Edition, Garland publishing Inc., New York and London.


**ECOLOGY:**


- Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John and Sons, Inc.
- Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
- Odum, E.P., (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Robert Leo Smith Ecology and field biology Harper and Row publisher
- Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Pres


**FUNDAMENTALS OF BIOCHEMISTRY:**


- Cox, M.M and Nelson, D.L. (2008). Lehninger's Principles of Biochemistry, V Edition, W.H. Freeman and Co., New York.
- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). Biochemistry, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry, XXVIII Edition, International Edition, The McGraw-Hill Companies Inc.
- Hames, B.D. and Hooper, N.M. (2000). Instant Notes in Biochemistry, II Edition, BIOS Scientific Publishers Ltd., U.K.
- Watson, J.D., Baker, T.A., Bell, S.P., Gann, A., Levine, M. and Losick, R. (2008). Molecular Biology of the Gene, VI Edition, Cold Spring Harbor Lab. Press, Pearson Pub.


**PHYSIOLOGY: CONTROL & COORDINATION:**


- Guyton, A.C. & Hall, J.E. (2006). Textbook of Medical Physiology. XI Edition. Hercourt Asia PTE Ltd. /W.B. Saunders Company.
- Tortora, G.J. & Grabowski, S. (2006). Principles of Anatomy & Physiology. XI Edition John Wiley & sons
- Victor P. Eroschenko. (2008). diFiore's Atlas of Histology with Functional correlations. XII

Edition. Lippincott W. & Wilkins.

**Practical**

PAH Solapur University, Solapur, Faculty of Science
Choice Based Credit System (CBCS)
B.Sc.-II Zoology
( 2020-2021 : w.e.f. June 2019) **

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## Practical-I (Paper-V & VI): Cell Biology and Principles of Ecology (04 Credits)

1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis.

2. Study of various stages of meiosis in onion flower buds.

3. Demonstration/ Observation of Barr body using permanent slide(s) ***(spotter)***

4. Study of principle and procedure and technique using permanent slide ***(spotter)***
i) DNA by Feulgen technique.
ii) Mucopolysaccharides by Periodic Acid Schiffs Reaction (PAS)

5. Study and construction of ecological pyramid from given data:
***i) Members of Grass land ecosystem –***
Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard.
***ii) Members of Pond ecosystem –***
Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra.

6. Calculation of Shannon-Weiner diversity index from the given data/ model.

7. Study of an aquatic ecosystem: Identification of Zooplankton with the help of permanent slides (***Spotters***),
8. Estimation of Dissolved Oxygen (Winkler's method) from given sample,
9. Estimation of Carbondioxide ($CO_2$) from given sample.
10 .Estimation of Total Hardness content from given sample.

11 Study Visit: Report on a visit to National / Central / State institutes / Local water bodies/National Park/Biodiversity Park/Wild life sanctuary.

**Practical-II**
**(Paper-VII & VIII):**

FUNDAMENTALS OF BIOCHEMISTRY and ANIMAL PHYSIOLOGY: CONTROLLING AND COORDINATING SYSTEMS (CREDITS-04) ******

1. Qualitative tests of functional groups in carbohydrates, proteins and lipids.

2. Estimation of protein by colorimetric method.

3. Estimation of carbohydrates by colorimetric method.

4. Demonstration of paper chromatography of amino acids.

5. Action of amylase or papain enzyme under optimum conditions.

6. Effect of pH, temperature and inhibitors on the action of amylase.

7. Demonstration of proteins separation by SDS-PAGE.

8. Recording of simple muscle twitch/ Cardiogram – demonstration. (Virtual frog/ computer generated)
(Analysis of given graph of Frog- muscle twitch or cardiogram In the examination students are provided with any one computer generated graph and supposed to 'Analyze the given graph and explain details of principle, procedure, result, Inference and viva-voce based on the given practical is expected)

9. Study of permanent slides (T.S./V,S.) - of Mammalian organs using permanent slides:
i) Tooth ii) Salivary gland iii) Stomach iv) IIeum v) Liver vi) Pancreas vii) Kidney viii) Testis ix) Ovary

10. Study of ABO blood group system and blood group antigens

11. Microtomy: Study of principle , procedure and mechanism of micro-technique and microtome : flow chart of technique, study of procedure and observation of HE staining technique/ whole mount using permanent slides (study of protocol using flowchart).

12. Study visit: Visit to wetlands, medical college, pathology laboratory and blood bank

**OR**

13. Preparation and submission of small project/ review on topics related to ecology, cell biology, biochemistry and physiology

****Note:**

As per the guidelines of **UGC notification number F.14-6/2014(CPP-II) dated 1st August, 2014** it is now essential to make necessary modifications to stop dissection and promote and orient students towards the knowledge component rather than skill development. However, ITC based virtual dissections are promoted. Now, the responsibility to discontinue dissections and use of animals in experiments totally rests on concerned authorities of respective colleges/Institutes. As per the notification it is important to encourage the field trips and observations without disturbing the biodiversity. For laboratory observations existing permanent slides and specimens should be shown. As per the guidelines of UGC , all the Zoology departments should be empowered with infrastructure to adopt Information communication technology (ICT) required for the purpose of virtual dissections for which virtual class room / laboratory to be enriched with few computers ( according to the strength of students ),internet facility , printer etc.

**Skeleton paper for practical examination**
**(University Examination for 40 Marks)**

| **Practical-I (Paper-V & VI)**<br>**Cell Biology and Principles of Ecology** | | |
|---|---|---|
| **Questions** | | **Marks** |
| Q-1: | Preparation of temporary stained squash of onion root tip to study various stages of mitosis ***OR*** Study of various stages of meiosis in onion flower buds. | 08 |
| Q-2: | Estimation from given sample - of Dissolved Oxygen (Winkler's method) **OR** Carbondioxide ($CO_2$) ***OR*** Total Hardness content | 08 |
| Q:3: | Study and construction of ecological pyramid from given data:<br>***i) Members of Grass land ecosystem –***<br><br>Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard.<br><br>**OR**<br><br>***ii) Members of Pond ecosystem –***<br><br>Sponge, Nepa, Leech, Planaria, Hydra, Lymnea, Planorbis, Heron, Kingfisher, Cyclops, Daphnia, Tortoise , Diatoms Vallisneria, Hydrilla, Chara and Spirogyra. | 08 |
| Q:4 | Spotting / Identification (Any four)<br>Zooplankton with the help of permanent slides (chart/ model /photo) / Bar body (***Spotters***). | 08 |
| Q:5 | Submission of tour report and viva-voce | 04 |
| Q:6 | Submission of certified journal | 04 |
| **Total Marks** | | **40** |

| **Practical-II (Paper-VII & VIII):**<br>Fundamentals of Biochemistry and Animal Physiology:<br>Controlling and Coordinating Systems | | |
|---|---|---|
| **Questions** | | Marks |
| Q-1: | Qualitative tests of functional groups in carbohydrates, proteins and lipids.<br><br>Or<br>Estimation of protein and carbohydrates by colorimetric method. | 08 |
| Q-2: | Action of amylase or papain enzyme under optimum conditions<br><br>**Or**<br><br>Effect of pH, temperature and inhibitors on the action of amylase.<br><br>**Or**<br>Study of ABO blood group system and blood group antigens | 08 |
| Q:3: | Recording of simple muscle twitch demonstration. / Cardiogram (Virtual frog)<br><br>**Or**<br><br>Microtomy: Study of principle and mechanism of microtechnique: flow chart of technique, study of procedure and observation of Haemotoxylene Eosine staining technique using permanent slides. | 08 |
| Q:4 | Spotting / Identification (any 4).<br>**Mammalian T.S. or V.S. -** Tooth / Salivary gland / Stomach / IIeum / Liver / Pancreas / Kidney / Testis / Ovary | 08 |
| Q:5 | Submission of tour report / Project/ review and viva-voce | 04 |
| Q:6 | Submission of certified journal | 04 |
| **Total Marks** | | **40** |

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR


**NAAC Accredited-2015**

**'B' Grade (CGPA 2.62)**

## Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: PHYSICS

## Name of the Course: B.Sc. II (Sem–III & IV)

**(Syllabus to be implemented from w.e.f. June 2020)**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

## B.Sc. Part – II

## Core Subject: - Physics

## (New CBCS Semester Pattern) syllabus w e f June 2020)

1. There will be four theory papers (Paper V and Paper VI for semester III and Paper VII and Paper VIII for semester IV) of 50 marks and 2 credits each. Annual practical examination will be of 100 marks and 4 credits. Total marks for physics as a core subject will be 300 [200 marks (8 credits) for theory and 100 marks (4 credits) for practical). Assessment system for both theory and practical will be of 80 % UA (University Assessment) and 20 % CA (College Assessment).
2. There shall be three periods per paper per week for theory and eight periods per week per practical batch of 16 (Sixteen) students each.
3. Duration of theory examination for each paper of 40 marks will be 2 hours each and that for the practical examination will be two days means 4 sessions of 3 hours each.
4. The theory examination of paper V and VI will be held at the end of semester III.
5. The theory examination of paper VII and VIII will be held at end of semester IV.
6. The practical examination of the both semester will be held at the end of semester IV. Every student will have to perform four experiments i.e. any one from each group.
7. Report of 20 % CA (5 Marks for internal examination and 5 Marks for assignment of each paper of every semester) of theory and practical (5 Marks for each group at the end of second term of B Sc Part II before commencement of University examination of fourth semester) has to submit by the College in the University office.

# Titles of Physics as a core subject with their paper codes

**Semester – III**

Paper – V - General Physics and Sound. - 50 (80 % UA + 20 % CA) Marks

Paper –VI - Electronics - 50 (80 % UA + 20 % CA) Marks

**Semester – IV**

Paper – VII - Optics - 50 (80 % UA + 20 % CA) Marks

Paper – VIII - Modern Physics - 50 (80 % UA + 20 % CA) Marks

**Annual Practical at the end of Fourth semester 100 (80 % UA + 20 % CA) Marks**

**[UA (University Assessment): Four groups each of 15 marks, 10 Marks for Journal, 10 Marks for educanctional trip / industrial visit/ seminar or conference attendance/ project report; CA (College Assessment): 20 Marks]**

## Equivalent Subject for Old Syllabus

| Sr. No. | Name of the Old Paper | Name of the New Paper |
|---|---|---|
| 1) | Paper: V General Physics, Heat and Sound | Paper: V General Physics and Sound |
| 2) | Paper: VI Electronics | Paper: VI Electronics |
| 3) | Paper: VII Optics | Paper: VII Optics |
| 4) | Paper: VIII Modern Physics | Paper: VIII Modern Physics |

# Semester III

## Physics Paper V - General Physics and Sound

## (50 Marks and 2 Credits)

**1. Vectors:** [6 hr]

1.1 Scalar and vector triple product

1.2 Scalar and vector fields

1.3 Del operator

1.4 Gradient of a scalar

1.5 Divergence of a vector and their physical significance

1.6 curl of vector and their physical significance

**2. Precessional Motion: -** [6 hr]

2.1 Precession
2.2 Gyroscope
2.3 Nutation
2.4 Lanchester's rules
2.5 Gyrostatic pendulum

2.6 Motion of rolling disc

2.7 Gyroscopic applications in brief

**3 . Elasticity: -** [6 hr]

3.1 Bending of a beam

3.2 Bending moment

3.3 Cantilever

3.4 Centrally loaded beam

3.5 Y and $\eta$ by Searle's method

**4. Viscosity: -** [6 hr]

4.1 Motion in a viscous medium- Stoke's law

4.2 Viscosity of liquid by rotating cylinder method

4.3 Searle's viscometer

4.4 Ostwald's viscometer

4.5 Viscosity of gasses – Rankin's mehod

**5. Sound:** [6 hr]

5.1 Acoustic transducers i) Pressure microphone ii) Moving coil loudspeaker

5.2 Acoustics and its affecting factors

5.3 Reverberation time and its optimum value

5.4 Requirements of good acoustics

5.5 Sabine's formula

**Reference Books:**


1. Elements of matter – D.S. Mathur
2. Physics for degree students – C. L. Arora, P. S. Hemne.
3. Text book of properties of matter – N. S. Khare , S. K. Kumar
4. Text book of Sound – Brijlal and Subramanyam.
5. Sound – Khanna and Bedi
6. Sound – Wood A. B.
7. Mathematical Physics – Rajput & Gupta
8. Engineering Physics Part I – Selladurai PHI Learning Pvt. Ltd, New Delhi

# Semester III

## Physics Paper VI - Electronics - (50 Marks and 2 Credits)

**1. Transistor amplifier : [8 hr]**

1.1 Transistor biasing: voltage divider bias

1.2 Two stage R-C coupled transistor amplifier

1.3 Frequency response curve of an amplifier

1.4 Feedback

1.5 Effect of positive and negative feedback on the frequency response curve

1.6 Differential amplifier

1.7 Modes of operation

1.8 Common mode and differential mode signals

1.9 Comparison between normal amplifier and differential amplifier

**2. Oscillator : [6hr]**

2.1 Types of waveforms

2.2 Oscillations from tank circuit

2.3 Barkhausen's criterion for sustained oscillations

2.4 Concept of AF and RF Oscillator

2.5 Phase shift oscillator

2.6 Colpitt's oscillator

2.7 Hartley oscillator,

2.8 Crystal Oscillator (qualitative treatment only)

**3. Unipolar Devices: [4 hr]**

3.1 FET: Construction, operation and characteristics

3.2 Application of FET as VVR

3.3 UJT: Construction, operation and characteristics

3.4 UJT as voltage sweep generator

**4. Electronic Instruments:** [6 hr]

4.1 Principle, Construction and working of CRT

4.2 Block diagram of CRO

4.3 Uses of CRO

4.4 Digital Multimeter (DMM) and its applications

**5 . Regulated power supply** [6hr]

5.1 Regulated power supply (with block diagram) and its need

5.2 Line and load regulation

5.3 Transistor Series power supply

5.4 IC voltage regulators

5.5 Fixed output voltage regulators (using IC 78XX and 79XX)

5.6 Dual power supply using 3 pin IC

## REFERANCE BOOKS:


1. Principles of electronics - V.K. Mehta
2. Electronics principles - (3rd and 6$^{th}$ edition) - Malvino.
3. Op-Amps and linear integrated circuits (4th edition) - Ramakant Gayakwad.
4. A Text book of Electrical Technology Vol. IV – B. L. Theraja, A.K. Theraja

# Semester IV

## Physics Paper VII - Optics - (50 Marks and 2 Credits)

**1. Cardinal points:** **[6hr]**

1.1 Lagrange's equation
1.2 Cardinal points of optical system
1.3 Graphical construction of image using cardinal points &Newton's formula

1.4 Relation between focal lengths for any optical system

1.5 Relations between lateral, axial and angular magnifications
1.6 Thick lens (introduction)
1.7 combination of two thin lenses

**2. Interference of light:** **[6hr]**

2.1 Michelson's interferometer

2.2 Applications of Michelson's interferometer to measure i) wavelength of light

ii) Difference in wavelengths and iii) Refractive index of thin film

2.3 An Etalon (Introduction Only)

2.4 Construction and working of Fabry Perot interferometer

2.5 Superiority of F.P. interferometer over Michelson's interferometer

**3 . Diffraction of light & resolving power:** **[7hr]**

**3.1** Fresnel's half period zones

3.2 Explanation of rectilinear propagation of light

3.3 Zone plate

3.4 Fresnel's diffraction at straight edge

3.5 Geometrical and spectral resolution

3.6 Distinction between magnification and resolution

3.7 Rayleigh's criterion for the limit of resolution and modified Rayleigh's criteria

3.8 Modified Rayleigh's criterion

3.9 R.P. of plane diffraction grating

4.0 R. P. of prism

4 **Polarization:** **[7hr]**

4.1Concept of Polarization

4.2 Double refraction and

4.3 Huygen's explanation of double refraction through uni-axial crystals

4.4Nicol's prism

4.4 optical rotation

4.5 Optical Activity and Specific Rotation

4.6 Laws of rotation and plane of polarization

4.7 Polaroid and their Use to Polarization

4.8 Applications a) Polarimeter

b) Liquid crystal Displays (LCDs)

**5. Optical Fibers: [4hr]**

5.1 Structure of fibers

5.2 Types of optical fiber

5.3 Numerical aperture

5.4 Pulse dispersion in step index fiber

5.5 Fiber optic communication system

5.6 Advantages of optical fiber

## Reference Books:


1. Optics and Spectroscopy – R. Murigation
2. Text book of optics (new edition) – Brijlal and Subramanyam
3. Optics (Second edition) – Ajay Ghatak
4. Geometrical and Physical optics – D. S. Mathur
5. Fundamental of optics – Jenkins and white
6. Optics and Atomic physics – Satya Prakash
7. Engineering Physics – S. Selladurai
8. Optical Communication - Jain, Mathur (Kanpur IIT)

# Semester IV

## Physics Paper VIII - Modern physics - (50 Marks and 2 Credits)

**1. Theory of relativity: [9 hr]**

1.1 Inertial frame of reference

1.2 Galilean transformation

1.3 Invariance of laws of mechanics under Galilean transformation

1.4 Ether hypothesis

1.5 Michelson-Morley experiment

1.6 Einstein's postulates of the special theory of relativity

1.7 Lorentz transformation

1.8 Variation of length with velocity

1.9 Variation of time with velocity

1.10 Velocity addition theorem

1.11 Variation of mass with velocity

1.12 Mass energy relation

1.13 Twin paradox

**2. Matter waves: [6 hr]**

2.1 De Broglie's hypothesis of matter waves

2.2 De Broglie's wavelength

2.3 Particle velocity, group velocity , phase velocity & their interrelationship

2.4 Properties of matter waves

2.5 Bohr's quantum condition on the basis of matter wave hypothesis

2.6 Heisenberg's uncertainty principle and its illustrations

**3. Vector Atom model: [8 hr]**

3.1 Space quantization

3.2 Spin hypothesis

3.3 Stern-Gerlache experiment

3.4 Quantum numbers associated with vector atom model

3.5 Pauli's exclusion principle

3.6 Spin orbit coupling

3.7 Hund's rule

3.8 Total angular momentum

3.9 L-S coupling

3.10 j-j coupling

3.11 Zeeman effect

3.12 Normal and anomalous Zeeman effect

3.13 Debye's explanation of normal Zeeman effect

**4. Compton effect: [3 hr]**

4.1 Compton Effect

4.2 Expression for change in wavelength for scattered photon

4.3 Experimental verification of Compton effect

**5. Nuclear Energy sources: [4 hr]**

5.1 Neutron induced nuclear reaction

5.2 Nuclear fission

5.3 Energy released in fission

5.4 Chain reaction (Atomic Bomb)

5.5 Nuclear reactor

5.6 Atomic energy in India

**Reference Books:**


1. Introduction to special relativity - Robert Reshnik
2. Perspective of Modern Physics – Arther Beiser
3. Atomic and nuclear Physics – Gupta and Ghosh 2nd Edition
4. Quantum Mechanics – Singh, Bagade, Kamal Singh, Chand and Co.
5. Introduction to Atomic and Nuclear Physics – H. Semat and Albrought
6. Atomic Physics - Rajam
7. Modern Physics – S. H. Patil (IIT)
8. Nuclear Physics -Kaplan

# B.Sc. II Physics Practical
# (100 Marks and 4 Credits)

## (With effect from - June 2020)

## List of Experiments

### Group I (General Physics, Heat and Sound)

1. Young's Modulus (Y) by bending of the centrally loaded beam.
2. Y or η of the material in the form of wire by Searle's method.
3. Young's modulus (Y) by Vibration of a bar.
4. Kater's Pendulum.
5. Surface tension by Quinke's method.
6. Viscosity of liquid by Searle's method.
7. Surface Tension of liquid by capillary rise method.
8. Thermal conductivity of rubber tube.
9. Velocity of sound by Kundt's tube
10. Velocity of sound by resonating bottle.

### Group II (Electronics)

1. Transistor series voltage regulator.
2. Biasing network.
3. Use of C.R.O. for measurement of AC, DC voltage and frequency.
4. Characteristics of FET.
5. UJT as voltage sweep generator.
6. Colpitt's oscillator.
7. Phase shift oscillator.
8. De Morgan's theorems.
9. Two stage RC coupled amplifier
10. Construction of half adder & full adder using gates

## Group III (Optics)

1. Biprism : To determine the wavelength of monochromatic light
2. Goniometer : Equivalent focal length for different thick lenses.
3. Goniometer : Cardinal points
4. Determination of Cauchy's Constants
5. Double refracting prism
6. Optical activity of sugar solution (Polarimeter)
7. Diffraction at single slit
8. Resolving power of grating
9. Diffraction due to cylindrical obstacle.
10. Wedge shaped film: Measurement of thickness

## Group IV (Electricity, Magnetism and Modern Physics):

1. Constants of B.G.
2. Comparison of Capacities by Deshotty's method.
3. Mutual Induction of two separate coils or ttransformer coils (Primary & Secondary)
4. Low resistance by Carry fosters method
5. High resistance by nearly equal deflection method
6. Solar cell characteristics to determine fill factor and efficiency
7. Impedance of LCR parallel circuit at resonating state
8. Sharpness of series resonance circuit
9. Study of Characteristics of G M tube and determination of its operating voltage, Platue length and slope etc
10. Verification of inverse square law for gamma rays

NB: At least eight experiments from each group are required to certify the journal. 10 Marks for certified journal should not be given in case of lost certificate&10 Marks for educational trip / industrial visit/ seminar or conference attendance/ project report. Such students may appear the practical examination of 80 marks with prior permission of his/her Principal. Examiner and Laboratory Supervisor will allow him / her only after submission of permission letter and lost certificate from his / her Principal.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

**Nature of Question Paper for choice based credit system (CBCS) Semester Pattern**

**• Faculty of Science •**

**(w. e. f. June 2020)**

**Time: - 2 hrs.** **Total Marks-40**

**Instructions:**

1. All questions are compulsory.
2. Draw **neat diagrams** and give **equations** wherever necessary.
3. Figures to the **right** indicate **full marks**.
4. Use of logarithmic table and calculator is allowed.

**Q. No.1) Multiple choice questions** (08)

1) ----------

a) b) c) d)

2)

3)

4)

5)

6)

7)

8)

**Q.No.2) Answer any four of the following** (08)

i)

ii)

iii)

iv)

v)

vi)

**Q.No.3 Write notes on any Two of the following** (08)

i

ii)

iii)

**Q. No.4) Answer any Two of the following** (08)

i)

ii)

iii)

**Q.No.5) Answer any one of the following** (08)

i)

ii)

**NB:** Minimum two numerical type sub questions must be asked in question number 1 and 2.
One each from question number 3 and 4 must be of numerical type sub question.

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

## CHOICE BASED CREDIT SYSTEM

# Syllabus: Mathematics

## Name of the Course: B.Sc. II (Sem.– III & IV)

## (Syllabus to be implemented from w.e.f. June 2020)

**B.Sc.II - Mathematics :**

**Preamble :**

B.Sc.II Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology. Also logical development of the various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things. In the theory courses of algebra, Laplace transformation, differential calculus and differential equations various deductions of the theorems, corollaries and lemmas will be acquired by the students. Change is the universal truth of the nature and it can be presented with the help of dependent and independent variables in the form of functions and differential equations. So our aim is that students should learn various techniques to find solutions of differential equations. Students who opted S.Y.B.Sc. Mathematics have to complete 4 theory courses 2 each semester, two practicals entitled (Numerical Techniques in Laboratory ) NTL-II courses (Annual). In the practical course of 100 marks students exercise the problem solving techniques for practical course I and II. The details are mentioned in the syllabus..

**Objectives of the course :** The aim of the course is to generate intelligent and skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To inculcate conceptual understanding in basic phenomena, statements, theorems and development of appropriate problem solving skills suitable for applications and abstract algebraic techniques, sufficient logical connectivity is provided.

**Following are the objectives-**

i. To design the syllabus with specific focus on key Learning Areas.
ii. To equip student with necessary fundamental concepts and knowledge base.
iii. To develop specific problem solving skills.
iv. To impart training on abstract concepts, analysis, deductive tecchniques.
v. To prepare students for demonstrating the acquired knowledge.
vi. To encourage student to develop skills for developing innovative ideas.

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

**Faculty of Science & Technology**

**Choice Based Credit System (CBCS)**

**(w.e.f.2020-21)**

**Draft Structure for B. Sc-II**

| Subject/ Core Course | Name and Type of the Paper | | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | Type | Name | | L | T | P | | | | |
| **Class :** | | | **B.Sc.- II** | **Semester – III** | | | | | | |
| **Core** (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR** | | C-5 | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-6 | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-7 | Paper-V | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VI | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | SEC-1 | | | | | | | | |
| | | GE-3 | | | | | | | | |
| **Grand Total** | | | | **18** | -- | -- | **300** | **240** | **60** | **12** |
| **Class :** | | | **B.Sc.- II** | **Semester – IV** | | | | | | |
| **Core** (*Students can opt any Three subjects among the Four Subjects offered at B.Sc.I. Out of Three Subjects offered One Subject will be the Core Subject **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc.I. Out of Two Subjects One Subject will be the Core Subject and any One Subject among the other willbe Elective Subject | | C-8 | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-9 | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4.0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | C-10 | Paper-VII | 3.0 | -- | -- | 50 | 40 | 10 | 4. 0 |
| | | | Paper-VIII | 3.0 | -- | -- | 50 | 40 | 10 | |
| | | SEC-2 | | | | | | | | |
| | | GE-4 | | | | | | | | |
| | | Environmental Studies | | 3.0 | -- | -- | 50 | 40 | 10 | NC |
| **Total (Theory)** | | | | **21** | -- | -- | **350** | **280** | **70** | **12** |
| **Practical** | | C-5 & C-8 | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | | C-6 & C-9 | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | | C-7 & C-10 | Pr. III&IV | -- | -- | 8 | 100 | 80 | 20 | 4.0 |
| | | GE-3 & GE-4 | | | | | | | | |
| **Total (Practical)** | | | | | | **24** | **300** | **240** | **60** | **12** |
| **Grand Total** | | | | **39** | | **24** | **950** | **760** | **190** | **36** |

***Core SubjectsChemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology/ Geography/Psychology Core Subjects- (Additional)-Geochemistry/Biochemistry/ Meterology/Plant Protection**

# Summary of the Structure of B.Sc. Programme as per CBCS pattern

| Class | Semester | Marks-Theory | Credits-Theory | Marks-Practical | Credits-Practicals | Total – credits |
|---|---|---|---|---|---|---|
| **B.Sc.-II** | III | 300 | 12 | -- | -- | 12 |
| | IV | 350 | 12 | 300 | 12 | 24 |
| **Total** | | 650 | 24 | 300 | 12 | 36 |

## B.Sc. Programme :

**Total Marks** : Theory + Practical's = 650 +300 =950
**Credits** : Theory + Practical's = 12 + 24 = 36
**Numbers of Papers** Theory: Ability Enhancement Course (AECC) : 00
Theory: Discipline Specific Elective Paper (DSE) : 00
Theory: CC : 06
Skill Enhancement Courses : 00
GE **:** 00
**Total** : Theory Papers :
: Practical Papers :

## Abbreviations :

L: Lectures
T: Tutorials
P: Practicals
UA : University Assessment
CA : College Assessment
DSC / CC: Core Course
AEC : Ability Enhancement Course
DSE : Discipline Specific Elective Paper
SEC : Skill Enhancement Course
GE : Generic Elective
CA: Continuous Assessment
ESE: End Semester Examination

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## Faculty of Science & Technology

### Syllabus for B.Sc.II-Mathematics

### Semester System

### Choice Based Credit System (CBCS) Pattern

**To be implemented from Academic Year 2020 -21**

**1. Course Structure:**

| Sr. No | Semester | Paper No. | Title | No. of Lectures | Credit Point | Total Marks |
|---|---|---|---|---|---|---|
| 1. | Semester-III | V | Differential Calculus | 45 | 2 | 50 |
| | | VI | Laplace Transform | 45 | 2 | 50 |
| 2. | Semester-IV | VII | Differential Equations | 45 | 2 | 50 |
| | | VIII | Abstract algebra-I | 45 | 2 | 50 |
| 3. | Semester III and IV (Annual) | | Numerical Techniques in Laboratory[NTL-II A & B] Practical Course (Annual) | | 4 | 100 |
| | | | Total Marks | | 12 | 300 |

**2. Distribution of each Theory paper (Marks 50)**

University Assessment (UA) : 40 Marks

College Assessment (CA) : 10 Marks

Scheme of College Assessment

1. Unit Test : 05 Marks
2. Home Assignment : 05 Marks

**3. Distribution of Practical Marks (100)**

Practical examination will be at the end of fourth semester. The candidate has to perform four practicals, one from each group.

**A. University Practical Examination (80) Marks: (UA)**

**a)** Problems from paper-V 15:

**b)** Problems from paper-VI 15:

**c)** Problems from paper-VII 15:

**d)** Problems from paper-VIII 15:

**e)** Journal 20:

**B. Practical : Internal Continuous Assessment (20 marks)**

Scheme of Marking: **10 Marks:** Internal Test on any four practicals,

**10Marks:** Home assignment/oral/Seminars/Conference /Industrial Visit/Group Discussion/Viva, etc.

# Semester -III

## Paper –V ( Differential Calculus )

**Unit-1. Tangents and Normals:**

Equations of tangents and Normals, Angle of intersection of two curves, Length of tangent, normal, subtangent, subnormal at any point of a curve, Pedal equations or p, r equations (Cartesian form), Angle between radius vector and tangent, Length of the perpendicular from pole to the tangent, Length of polar subtangent and polar sub-normal, Pedal equations (polar form). **[13]**

**Unit-2. Curvature :**

Definition of Curvature, Length of arc as a function, Radius of curvature, Cartesian Equation, Parametric Equations, Polar Equations, Pedal Equations. **[12]**

**Unit-3. Jacobians:**

Definition of a Jacobian, Jacobian of a function of function, Jacobian of implicit function, Condition of dependent functions (statement only). [**08]**

**Unit- 4. Maxima and Minima :**

Definiton of Maximum value and minimum value of a function of one, two variables, Necessary condition for extreme values(Statements only), sufficient condition for extreme values (Statements only), Use of second order derivatives. Maxima and Minima of a function of two variables, Lagrange's Method of undetermined multipliers of two variables and three variables. **[12]**

**Recommended Book( Scope of Syllabus):**

**Differential Calculus by *Shanti Narayan and P.K.Mittal S.Chand Publication Revised Edition 2005.***

**Unit 1 :**7.2,7.3,7.4,7.5,7.6,7.7,7.8,7.9,7.10,7.11
**Unit 2 :**14.1,14.2,14.3.
**Unit 3 :**12.1,12.2,12.3,12.4
**Unit 4 :** 9.1,9.2,9.3,9.4, 9.6

**Reference Books**


1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus , Nirali Prakashan Pune.
2. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. ,B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Calculus , Phadke Prakashan Kolapur .
3. Gorakh Prasad, Differential Calculus, Pothishala Pvt. Ltd., Allahabad
4. N. Piskunov, Differential and Integral Calculus, Peace Publishers, Moscow
5. P. N. Wartikar and J. N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
6. Tom M. Apostol, Calculus Vol I and II, Wiley Publication.

## Paper - VI: (Laplace Transform)

**Unit 1: Laplace Transform. [15]**

Integral Transform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of F(t), Laplace Transform of the $n^{th}$ order derivatives of F(t), Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t, Multiplication by $t^n$, Division by t, Evolution of Integrals, periodic functions.

**Unit 2: The Inverse Laplace Transform. [15]**

Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p, Division by powers of p, Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.

**Unit 3: Application of Laplace Transforms. [15]**

Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients .Partial differential equation

**Recommended Books for Paper – VI (Integral Transform):**

**Integral Transform** by *Vasistha* A.R., Gupta R.K., Krishna Prakashan *Media Pvt. Ltd. 11. Shivaji Road, Meerut India.*

**Unit 1:** 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21.

**Unit 2:** 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17

**Unit 3:** 3.1, 3.2, 3.4,

**Reference Books:**


1. The Laplace Transform by Rainville E.D.
2. Integral Transform byDr. J.R. Goyal and K.P. Gupta, Pragati Prakashan Meerut.
3. Differential equation by Sharma and Gupta, Krishna Prakashan Media Co.Meerut
4. Integral Transform and their Applications by Lokenath Debnath, CRC Press.
5. An introduction to Lapace Tranforms and Fourier series by Phill Dyke , Springer publication.

# Semester – IV

## Paper – VII (Differential Equations)

**Unit 1:- Differential Equations of the first order and of degree higher than the first:**
Equations that can be resolved into factors of the first degree, Equations solvable for x, Equations solvable for y, Clairaut's equation, Equations reducible to clairaut's form. **[10]**

**Unit 2 : Linear Equations of the second order :**

General form of the second order linear equation, Complete solution when one integral belonging to complementary function is known ,Rules of getting an integral belonging to complementary function , Removal of the First order Derivative. Transformation of the linear equation of second order by Changing the independent variable. **[15]**

**Unit 3 : Homogeneous linear equations :**

Homogeneous linear equations, Working rule for finding the solution, Equations reducible to Homogeneous form. **[10]**

**Unit 4. Simultaneous Equations**

Nature of the solution of simultaneous equations, Rules of solving the Equation,

**Unit 5. Total Differential Equations**

Total Differential Equation, Necessary and sufficient condition for the integrability of total differential equation (proof of Necessity only), Condition for exactness, Criterion for exactness, Method of Solving the Equation. **[10]**

**Recommended Book:**

**Differential Equation:**

**Ordinary and Partial Differential Equations: by *M.D.Raisinghania,S.Chand Co.Ltd.Ramanagar,New Delhi-110055(Edition2002)***

**Unit 1 (Part I):**6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.9, 6.10, 6.11, 6.12.
**Unit 2 (Part I):**5.1, 5.2, 5.3, 5.6, 5.7.
**Unit 3 (Part II):**4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11.
**Unit 4 (Part II) :**5.1,5.2, 5.4,5.5,5.6,5.7.
**Unit 5 (Part II):**6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7.


1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VII Differential Equation , Nirali Prakashan Pune.

2. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. , B. Sc. – II (Mathematics) Semester-III, Paper –V Differential Equation, Phadke Prakashan Kolapur .

3. Differential Equation by Murrey.
4. Differential Equation by Diwan and Agashe
5. Differential Equation by Sharma-Gupta, Krishna Prakashan Media (Pvt.) Ltd, Meerut

## Paper –VIII (Abstract Algebra)

**Unit-1: Introduction to Groups** **[10]**

Definition and Example of Groups, Permutations, Subgroups, Groups and Symmetry.

**Unit -2: Equivalence, Congruence, Divisibility** **[10]**

Equivalence relation and partitions, Congruence and Division Algorithm, Integer Modulo n, Greatest Common Divisors, The Euclidean Algorithm, Factorization, Euler's Phi Function.

**Unit-3: Groups** **[10]**

Elementary Properties of Groups, Generators, Direct products, Cosets, Lagrange's Theorem, Isomorphism, More on Isomorphism, Cayley's Theorem.

**Unit-4: Group Homomorphism** **[10]**

Homomorphism of Groups, Kernels, Quotient Groups, The Fundamental theorem of Homomorphism.

**Recommended books ( Scope of Syllabus):**

**Modern Algebra-An Introduction**, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition

Unit – 1 : Chapter-II: Art. 5,6,7,8

Unit – 2 : Chapter-III: Art. 9,10,11,12

Unit – 3 : Chapter-IV : Art. 14,15,16,17,18,19,20 Ch- V :21,22,23

Unit – 4 : Ch- V :21,22,23

**Reference Books:**


1. Dr. Alandkar S. J., Prof. Dhanshetti N. I., Prof. Dhone A. S. and Prof. Mahimkar R. D. , B. Sc. – II (Mathematics) Semester-IV, Paper –VIII: Abstract Algebra -I, Nirali Prakashan Pune.
2. Dr. Jadhav .B.P, Prof. Mahajan A. M., Prof. Gade S. P. and Prof. Kokare. B. D. B. Sc. – II (Mathematics) Semester-III, Paper VIII: Abstract Algebra -I, –, Phadke Prakashan Kolapur
3. A First Course In Abstract Algebra J. B. Fraleigh Pearson Education $7^{th}$ edition.
4. University Algebra N.S. Gopalkrishnan.
5. Abstract Algebra David S. Dummit & Richard M. Foote Wiley & Sons, Inc.
6. Fundamentals of Abstract Algebra D. S. Malik & N. Mordeson & M. K. Sen Mc. Graw Hill International Edition.

6. A Course in Abstract Algebra by Vijay K. Khanna and S.K. Bhambri, Vikas Publishing House Pvt. Ltd.

**Numerical Technique in Laboratory -II [NTL - II]**
**(Differential Calculus , Laplace transforms, Differential Equation, Abstract Algebra)**

**[NTL – IIA ]**

**Assignment No.1:** Tangents and Normals

**Assignment No.2**: Curvature

**Assignment No.3 :** Jacobians

**Assignment No. 4 :** Maxima and Minima

**Assignment No. 5:** Laplace Transform

**Assignment No. 6:** Inverse Laplace Transform I

**Assignment No. 7:** Inverse Laplace Transform II

**Assignment No. 8:** Application of Laplace Transform

**[NTL – IIB]**

**Assignment No. 9:** Differential Equations of the first order and of degree higher than the first .

**Assignment No. 10:** Linear Equations of the second order (Part –I)

**Assignment No. 11:** Linear Equations of the second order & Homogeneous linear equations (Part –II)

**Assignment No.12:** Simultaneous Equations & Total Differential Equations

**Assignment No.13:** Introduction to Groups

**Assignment No.14:** Equivalence, Congruence, Divisibilty

**Assignment No.15:** Groups

**Assignment No.16:** Group Homomorphism

**With Effect from June -2020**

# Equivalent Subject for Old Syllabus

| Sr. No. | Name of the Old Paper | Name of the New Paper |
|---|---|---|
| 1) | Paper-V : Differential Calculus | Paper-V :Differential Calculus |
| 2) | Paper-VI: Real Analysis | Paper-VI: Laplace Transform |
| 3) | Paper-VII: Differential Equation | Paper-VII: Differential Equation |
| 4) | Paper-VIII : Abstract Algebra - I | Paper-VIII : Abstract Algebra - I |
| | Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual) | Numerical Techniques in Laboratory [NTL-II A & B] Practical Course (Annual) |

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**


**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

# Name of the Faculty: Science & Technology

**CHOICE BASED CREDIT SYSTEM**

# Syllabus: Microbiology

## Name of the Course: B.Sc. II (Sem–III & IV)

**(Syllabus to be implemented from w.e.f. June 2020)**

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

**Faculty of Science and Technology**

**Choice Based Credit System (CBCS)**

**(w.e.f. 2020-21)**

## Structure for B.Sc. II Microbiology (Semester III & IV)

| Subject/ Core Course | Name and Type of the Paper | | No. of Papers/ Practicals | Hrs / Week | | | Total Marks per paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Type** | **Name** | | **L** | **T** | **P** | | | | |
| **Class :** | **B.Sc. II Semester III** | | | | | | | | | |
| | Core | C5 | Paper – V Bacterial Cytology and Physiology | 3.0 | - | - | 50 | 40 | 10 | 3.0 |
| | Core | C6 | Paper – VI Bacterial Genetics | 3.0 | - | - | 50 | 40 | 10 | 3.0 |
| **Total** | | | | **6.0** | | | **100** | **80** | **20** | **6.0** |
| **Class:** | **B.Sc. II Semester IV** | | | | | | | | | |
| | Core | C7 | Paper VII Immunology & Medical Microbiology | 3.0 | - | - | 50 | 40 | 10 | 3.0 |
| | Core | C8 | Paper VIII Industrial Microbiology | 3.0 | - | - | 50 | 40 | 10 | 3.0 |
| | Ability Enhancement Course (AECC) | Environmental Studies | | 3.0 | - | - | 50 | 40 | 10 | 3.0 |
| **Total (Theory)** | | | | **9.0** | **-** | **-** | **150** | **120** | **30** | **9.0** |
| **Practical** | Core | C5 & C6 | Paper V& VI | - | - | 4.0 | 50 | 40 | 10 | 4.0 |
| | Core | C7 & C8 | Paper VII & VIII | - | - | 4.0 | 50 | 40 | 10 | 4.0 |
| **Total Practical** | | | | **-** | **-** | **8.0** | **100** | **80** | **20** | **8.0** |
| **Grand Total** (Semester III & IV with Practicals) | | | | **15.0** | **-** | **8.0** | **350** | **280** | **70** | **23.0** |

**B.Sc. II- Semester –III**

| Paper – V Bacterial Cytology and Physiology | | |
|---|---|---|
| **THEORY COURSE (03 Credits)** | | **Total Lectures 45L** |
| **Unit No.** | **Content of Unit** | **Lectures Allotted** |
| **I** | **Ultra-structure and Functions**<br>1. **Bacterial Cell wall**: chemical composition, structure and functions of cell wall of Gram Positive and Gram Negative bacteria<br>**2. Cell Membrane**: Chemical Composition, structure and functions. Transport across cell membrane – simple diffusion, facilitated diffusion, active transport & group translocation.<br>3. **Mesosome** & its functions**.**<br>4. **Flagella**: Structure and functions , Mechanism of movement, Tactic behaviors<br>5. **Pili**: Types, Structure and functions<br>6. **Cytoplasmic inclusions**: Chlorobium vesicles. Gas vacuoles, Magnetosomes and carboxysomes and their functions<br>7. **Reserve Food Materials**: Nitrogenous and Non nitrogenous and their role<br>8. **Bacterial Endospore**: Ultra-structure and functions, sporulation as an example of cell differentiation, Germination of endospore | **15 L** |
| **II** | **Bacterial Growth**<br>1. Definitions of - growth, generation time, growth rate and Synchronous Growth<br>2. Growth phases<br>3. Measurement of growth – Cell numbers, Cell Mass and Cell activity | **07 L** |
| **III** | **Effect of Environmental factors on Bacterial growth**<br>**1. Temperature** Psychrophiles, Mesophiles, Thermophiles, Thermodurics<br>**2. pH-** Acidophiles, Basophiles and Neutrophiles<br>**3. Oxygen-** Aerobic, Anaerobic, Facultative Anaerobic and Microaerophilic<br>**4. Osmotic pressure-** Osmophilic(Halophilic)<br>**5. Hydrostatic Pressure-** Barophiles<br>**6. Surface Tension** | **10 L** |
| **IV** | **Bacterial Metabolism**<br>1. **Fates of Pyruvate** – a) Aerobic Tri-Carboxylic Acid Cycle b) Anaerobic – Ethanol Fermentation c) Microaerobic – Lactic Acid Fermentation<br>2. **Modes of ATP generation** –<br>a. Substrate Level Phosphorylation,<br>b. Oxidative Phosphorylation - Respiratory electron transport chain, components of ETC, aerobic and anaerobic respiration<br>c. Photophosphorylation: photosynthetic ETC [cyclic & noncyclic] | **13 L** |

**Reference Books:**

1] Powar C.B. and Daginawala H.F. (1986). General Microbiology Vol. I & II (2nd Edition), Himalaya Publishing House, Mumbai.

2] Stanier R.Y, *et.al;* General Microbiology

3 Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi

4] Dubey, R.C and Maheswari, D.K. (2000) General Microbiology. S. Chand, New Delhi.

| Paper-VI Bacterial Genetics | | |
|---|---|---|
| **THEORY COURSE (03 Credits) ( 45 L)** | | |
| **Unit No.** | **Content of Unit** | **Allotted Lectures** |
| Unit-I: Structure of nucleic acids & Replication of Bacterial DNA | 1.Experimental evidenences for nucleic acid as genetic material-<br>• Griffith Experiment<br>• Avery, Macleod and McCarty's experiment<br>• Hershey and Chase experiment<br>2. Structure & forms or types of DNA-<br>• Watson and Crick's model of DNA<br>• A, B ,C and Z form of DNA<br>3.DNA replication-<br>• Modes of replication (Conservative, semoconservative and Dispersive)<br>• Messelson & Stahl's experimental proof of semoconservative replication<br>• Enzymes involved in replication<br>• Mechanism of DNA replication | 12 |
| Unit –II: Gene, Genetic code and Plasmid | 1. Definitions and concepts of -<br>• Gene<br>• Genome<br>• Genotype<br>• Phenotype<br>• Cistron, Recon & Muton<br>• Split gene-concept of intron and exons<br>2. Genetic code-<br>• Definition and properties of genetic code<br>3. Plasmid-<br>• Definition of plasmid and episome<br>• Properties of plasmid<br>• Types of plasmid-F plasmid, R plasmid, Col plasmid, Ti plasmid, Linear plasmid and Yeast 2µ plasmid<br>• Applications of plasmid | 09 |
| Unit-III: Bacterial Mutation & Repair | 1.Mutations & Mutagenesis-<br>• Definition of mutation<br>• Mutagen- physical and chemical Mutagens<br>2. Types of mutation-<br>• Base pair Substitution- Transition and Transversion<br>• Missense mutation<br>• Nonsense muataion<br>• Neutral Mutation<br>• Silent Mutation<br>• Frame shift Mutation | 12 |

| | | |
|---|---|---|
| | 3. Types of mutation on the basis of molecular mechanism-<br>• Spontaneous Mutation- Definition, Fluctuation Test, Replica plate technique<br>• Definition and Mechanism of Induced Mutations caused by-<br>• Physical Mutagen- U.V.rays<br>• Chemical mutagens- 5-Bromouracil, 2-aminopurine, Hydroxylamine, Nitrous acid, alkylating agent and Acridine dyes.<br>4. DNA repair-<br>• Photo reactivation<br>• Dark repair Mechanism-Excision repair (Base and Nucleotide) | |
| Unit- IV Bacterial Recombination | 1. Definition of recombination<br>2. Fate of exogenote<br>3.Types of recombination-<br>• Transformation- experimental proof & mechanism of transformation, Definition of transfection<br>• Conjugation- a)Discovery, experimental evidence (Leaderberg & Tautum's & Davis U Tube)<br>b) Mechanism of conjugation-<br>F+ X F-, HFr X F-, F'X F-<br>• Transduction- a) Discovery & experimental proof (Zinder & Leaderberg)<br>b) Types of transduction- Specialized, Generalized and Abortive transduction. | 12 |

**References:**


1] A J Salle: Fundamentals of Bacteriology

2] R Y Stainer, Roger et.al: General Microbiology

3] Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (1993). Microbiology. 5th Edition, Tata Mc Graw Hill Publishing Co., Ltd., New Delhi

4] Powar and Daginawala: General microbiology Vol. I, II, Himalaya Publishing House

5] Avinash and Kakoli Upadhay: Molbio, Himalaya Publishing House

6] Freifelder David: Microbial genetics, Jones and Bartlett Publications

7] James D Watson: Molecular biology of the gene, W. A. Benjamin, Inc.

**Semester IV**

| **Paper-VII Immunology & Medical Microbiology** | | |
|---|---|---|
| **THEORY COURSE (03 Credits)** **Total Lectures 45L** | | |
| **Unit No.** | **Content of Unit** | **Lectures Allotted** |
| **Unit I: Immunity** | 1. Immunity – Definition and concept<br>a. Innate immunity – Definition, Levels of innate immunity – Individual, racial and species immunity , Mechanism of innate immunity- mechanical, chemical, biological barriers[role of normal flora, cells of innate immunity and their role], inflammation and fever<br>b. Acquired immunity – definition, types- Active & passive | (12) |
| **Unit II: Antigen** & Antibody | 1. Antigen<br>a.definition,concept of hapten,antigenic determinant,<br>b.Types of antigen<br>c.factors affecting antigenicity<br>2. **Antibody** (immunoglobulin)<br>**a. Historical perspective-**Immune sera and concept of immunoglobulin<br>b. Basic structure of antibody (immunoglobulin)<br>c. Classes of immunoglobulins, physicochemical & biological properties and functions of Immunoglobulins. | (12) |
| **Unit III: Antigen – antibody reactions** | 1. Purposes of antigen antibody reactions<br>2. General features antigen antibody reactions<br>3. Measurement of antigen antibody reactions<br>4. Mechanism antigen antibody reactions<br>5. Types of antigen – antibody reactions: Agglutination test, precipitation test, flocculation test, complement fixation test, Immunofluorescence test | (09) |
| **Unit IV- Microbial Diseases Clinical Microbiology** | **A. Microbial Diseases**<br>1.Bacterial Infections- Enteric fever, Staphylococcl wound infections and Urinary tract infections<br>2.Fungal Infection-Candidiais<br>3.Viral Infection- Dengue fever<br>**B. Clinical Microbiology**<br>1.Basic concepts<br>2.Collection, handling & transportation of specimen<br>3. Methods of diagnosis of diseases- Microscopic, cultural, biochemical & Serological. | (12) |

**Reference Books:**


1. Ananthanarayana R. and Paniker, C.K.J. (2000). Text Book of Microbiology, 9th Edition, Oriental Longman Publications, USA.
2. Roitt, I.M. (1998). Essentials of Immunology, ELBS and Black Well Scientific Publishers, England.
3. Prescott, M.J., Harley, J.P. and Klein, D.A. (2002). Microbiology. 5th Edition, WCB McGrawHill, New York.
4. Dugid,J.P.,Medical Microbiology
5. Kubey - Immunology

**Semester -IV**

| **Paper VII: Industrial Microbiology** | | |
|---|---|---|
| **THEORY COURSE (03 Credits)** **Total Lectures 45L** | | |
| **Unit No.** | **Content of Unit** | **Lectures Allotted** |
| **UnitI: Industrial Microbiology** | 1. Definition and Scope of industrial Microbiology, industrial important organisms with products (lists)<br>2. Fermentations: Basic Concept, Types –Surface Culture Submerged Culture. Batch, Continuous culture (Chemostat & Turbidostat) , Dual and Multiple fermentation.<br>3. Design of typical Fermenter / Bioreactor: Parts and their functions | **(10)** |
| **UnitII: Fermentation Media** | 1. Media for industrial Fermentations<br>2. Media Components and Optimization<br>3. Use of Waste as a fermentation Media<br>4. Inoculum and Production media | **(12)** |
| **Unit III: Screening, Inoculum Development and Scale up** | 1. Screening: Primary and Secondary<br>2. Strain Improvement<br>3. Preservation of industrially important microorganisms<br>4. Inoculum Development<br>5. Scale up of Fermentation | **(09)** |
| **Unit IV: Specific Fermentations & Fermentation Product Recovery** | **a) Specific Fermentations**<br>**1.** Penicillin fermentation (*P.chrysogenium*)<br>2.Alcohol (*S.cerevisiae*)<br>3. SCP (*S.cerevisiae*)<br>4.Amylase (A.niger)<br>**b) Fermentation Product Recovery**<br>1. Criteria for selection of recovery method<br>2. Filtration, Centrifugation, Precipitation, Distillation, Crystallization and Drying. | **(14)** |

**Reference Books:**


1. Patel, A.H. (1984). Industrial Microbiology, Mac Milan India Ltd., Hyderabad.

2. Cassida, L.E. (1968). Industrial Microbiology, Wiley Eastern Ltd. & New Age International Ltd., New Delhi.

3. Prescott & Dunn, Industrial Microbiology

4. Purohit, Microbiology- Fundamentals and Applications, sixth edition

5. Stanbury PF, Whitaker A and Hall SJ. (2006). Principles of Fermentation Technology. 2nd edition,Elsevier Science Ltd.

**B. Sc. II Microbiology**

**Practical Course (Credits - 08)**

1. Stains and Staining Procedures

   i. Spore Staining [Dorner's method]

   ii. Flagella Staining [Bailey's Method]

   iii. Nuclear material Staining [Giemsa's method]

2. Preparation of culture media

   a. Wilson and Blair's medium

   b. Gelatin Agar

   c. Amino Acid Decarboxylation Medium

   d. Peptone Nitrate Broth

   e. Hugh and Leifson's Medium

   f. Amino Acid Deamination medium

   g. Christensen's urea agar

3. Preparation of Reagents and Solutions

   a. 1N NaOH

   b. 1N HCl

   c.10%Ferric chloride

   d. Nitrate reduction test reagents (α naphthylamine & Sulphanilic acid)

   e.1%Tannic acid

   f. Phosphate buffer solution of pH 7.0

   g. Benedict's reagent

   h. Biuret reagent

4. Biochemical Tests

   a. Gelatin Hydrolysis

   b. Amino Acid Decarboxylation

   c. Amino Acid Deamination

   d. Urea Hydrolysis

   e. Nitrate Reduction

f. Oxidase

g. Hugh and Leifson's

h. Catalase

5. Effect of environmental factors on growth of microorganisms

a. UV light

b. Heavy Metals

c. Salt Concentration (NaCl)

d. pH

e. Temperature

f. Antibiotics [Penicillin & Streptomycin]

6. Primary Screening:

a. Antibiotic Producers – Crowded Plate Technique

b. Amylase Producers – Replica Plate Technique

7. Isolation & Identification of Pathogenic Microorganisms from Clinical Samples

a. *Salmonella* spp.

*b. Candida spp.*

*c. Proteus spp.*

8. Determination of Blood Groups – ABO & Rh

9. Widal test (slide test): Qualitative

10. Glucose Estimation (Benedict's Method).

11. Protein Estimation (Biuret Method).

12. Study of Growth phases of *E.coli* by optical density method.

13. Isolation of DNA

**Practical Question Paper for University Practical Examination**

**Total Marks: 80**

| | |
|---|---|
| Q.1 Identification of Pathogen | 20 |
| Q.2 Biochemical Tests | 10 |
| Q.3 Staining / Screening | 10 |
| Q.4 Effects/ Growth Curve [lag phase] | 10 |
| Q.5 Glucose /Protein / Widal test/ Blood Groups | 10 |
| Q.6 Spotting on Media components, reagents and stains (05 Spots) | 10 |
| Q.7 Journal | 05 |
| Q.8 Tour Report | 05 |

The practical Examination will be conducted for two (2) successive days for 6 hours each day. There will be one batch of maximum 20 students each day.

**Internal Practical examination:**

**Total Marks: 20**

**The internal practical examination shall be as per scheme given by Faculty of Science.**

**Practical Examination will be conducted at the end of Semester IV**

**References for Practical course**

1] Cappuccino, J.G. and Sherman, N. (2005). Microbiology – A Laboratory Manual. 7th Edition. Pearson Education. Published by Dorling Kindersley (India) Pvt. Ltd.

2] Mukherjee, K.L. (1996). Medical Laboratory Technology. Vol II. Tata Mc GrawHill Publishing Co. Ltd., New Delhi

3] Dubey, R.C. and Maheswari, D.K. (2002). Practical Microbiology, S. Chand & Co., New Delhi

4] Naik Sandesh, Handbook of Practical microbiology

6] Frobisher, H., Hinsdil, R.D., Crabtree, K.T. and Goodhert, D.R. (2005) Fundamentals of Microbiology, Saunders and Company, London.

7] K.R.Aneja, Pranay Jain, Raman Aneja (2008). A Textbook of Basic and Applied Microbiology, New Age International Publishers

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।

**NAAC Accredited-2015**
**'B' Grade (CGPA 2.62)**

## Name of the Faculty: All Faculty

**CHOICE BASED CREDIT SYSTEM**

# Syllabus: Democracy, Elections and Good Governance

## Name of the Course: B.A., B.Com., & B.Sc.(Sem– I & II)

**(Syllabus to be implemented from w.e.f. June 2020-21)**

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSIY, SOLAPUR

Syllabus of

## Democracy, Elections and Good Governance

**For all Under Graduate Students of Semester – II**

## 2020-2021

Total Theory Lectures (15)

Total Mark: 50

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**Preamble & Objective of the Course (Rationale)-**

The rationale of the study is to make the pupils aware of the importance of democracy. What constitute democracy, what is its importance from the point of view of the role of individual and what exactly can a individual get if he performs his role well in the society. This module also aims to make the individual understand the different aspects of democracy and its implications in the overall development of the state. The syllabus is introduced from the point of view that all students upon entering into the college, enroll themselves as voters and encourage and enthuse other members of the society to participate not only in election process but also electoral and political process in general.

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**Unit- 1. Democracy in India** (No. of Lectures 05)

a) Indian parliamentary democracy

b) Lok Sabha

c) Rajya Sabha

**Unit- 2. Important concepts of Indian Democracy** (No. of Lectures 05)

a) Fundamental rights in Indian constitution

b) Fundamental duties in Indian constitution

c) Challenges of national integrity

**Unit- 3. Good Governance** (No. of Lectures 05

a) Meaning and concepts of good governance

b) Government and governance

c) Good governance from directives principles of state policy

**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**

पुण्यश्लोक अहिल्यादेवी होळकर
सोलापूर विद्यापीठ
।। विद्यया संपन्नता ।।
NAAC Accredited-2015
'B' Grade (CGPA 2.62)

## Name of the Faculty: For All Faculties

# Environmental Studies
# (Non-Credit)

## CHOICE BASED CREDIT SYSTEM

# Syllabus: ENVIRONMENTAL STUDIES

**(Syllabus to be implemented w.e.f. June 2020)**

# Punyashlok Ahilyadevi Holkar Solapur University, Solapur

## All UG for Fourth Semester Compulsory Paper

## Environmental Studies

## (CBCS - Syllabus) - 2020

1) **Title of the Paper:** Environmental Studies
2) **Pattern:** Semester and Credit system
3) **Total Contact Hours:** 45 hours

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# Structure for Environmental Studies

| Class & Semester | Code | Name and type of the paper | | L/P | Credits | Total Marks | UA | CA |
|---|---|---|---|---|---|---|---|---|
| | | Type | Name | | | | | |
| | | For All UG Semester IV (Second year) | | | | | | |
| All UG Second Year (4th Semester) | EVS | Ability Enhancement Course (AECC) and Non Credit | Environmental Studies | 50 | NC | 50 | 40 | 10 |
| **Compulsory: *Unit Test / Assignment/ Seminar/ Nature Visits / Field Work / Field Tour/ Industrial visits of 1-2 days and submission of report is compulsory under internals marks (CA)** | | | | | | | | |

1. The credit earned by student with this course shall not be considered for calculation of SGPA/CGPA
2. This course is not considered as a passing head for counting passing heads for ATKT
3. Student must pass this subject for award of the degree

**Evaluation Scheme:**

Theory paper has 50 marks out of which 40 marks will be for Term End examination and 10 marks for College Internal Assessment. The candidate has to appear for internal evaluation of 10 marks and external evaluation (University Examination) of 40 marks.

**A) College Internal Evaluation:**

In case of theory paper, internal examination has to conduct by department / college.

Marks for internal assessment shall be given based on Unit Test / Assignment/ Seminar/ Nature Visits / Field Work / Field Tour/ Industrial visits of 1-2 days and submission of report is compulsory under internals marks (CA).

**B) External Evaluation (End of Term University Examination):**

**I) Nature of Theory question paper:**

1) Theory paper is of 40 marks.
2) Theory paper will be of 2 hours duration
3) There shall be 05 questions each carrying 08 marks.
4) Students have to attempt all the questions.

# Syllabus As Per UGC Guidelines

*UGC Letter – File No. 13-01/2000 (EA/ENV/COS-01 Dated 14th May, 2019)*

# Environment Studies (AECC)

**Theory Lectures - (45)**

**Unit 1** : **Introduction to environmental studies (**2 lectures)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development

**Unit 2** : **Ecosystems** (6 lectures)

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems :
  a) Forest ecosystem
  b) Grassland ecosystem
  c) Desert ecosystem
  d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Unit 3** : **Natural Resources** : **Renewable and Non-renewable Resources** (8 lectures)

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources : Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

**Unit 4** : **Biodiversity and Conservation** (8 lectures)

- Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity : Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

**Unit 5** : **EnvironmentalPollution (**8 lectures)

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management : Control measures of urban and industrial waste.
- Pollution case studies.

**Unit 6** : **Environmental Policies & Practices** (7 lectures)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act, Air (Prevention, & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

**Unit 7** : **Human Communities and the Environment** (6 lectures)

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management : floods, earthquake, cyclones and landslides.
- Environmental movements : Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

**Unit 8** : **Field work** ( Equal to 3 lectures)

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, dam, pond, ocean / marine etc.

**Suggested Readings:**


1. Environmental Studies E - Text Book (Marathi and English Medium) Solapur University Solapur (2017).
2. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
3. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
4. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
5. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
6. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
7. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36-37.
8. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29-64). Zed Books.
9. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

10. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
11. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
12. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
13. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
14. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India*. *Tripathi 1992*.
15. Sengupta, R. 2003. *Ecology and economics*: An approach to sustainable development. OUP.
16. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
17. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
18. Thapar, V. 1998. *Land of the Tiger*: A Natural History of the Indian Subcontinent.
19. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
20. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
21. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.

**Nature of Question Paper for CBCS Semester Pattern**

**All UG and all Faculties**

**Paper: Environmental Studies (Compulsory)**

**Time: - 2 hrs.** **Total Marks: - 40**

***Instructions:***

1. ***All questions are compulsory***
2. ***Draw Neat diagram and give equations wherever necessary***
3. ***Figures to the right indicate full marks***

| | | |
|---|---|---|
| **Q. 1** | **Multiple choice questions (One Marks each)** | **08** |
| 1) | ……<br>a) b) c) d) | |
| 2) | | |
| 3) | | |
| 4) | | |
| 5) | | |
| 6) | | |
| 7) | | |
| 8) | | |
| **Q. 2** | **Answer any FOUR of the followings.** | **08** |
| | i) | |
| | ii) | |
| | iii) | |
| | iv) | |
| | v) | |
| | vi) | |
| **Q. 3** | **Write short notes on any TWO of the following** | **08** |
| | i) | |
| | ii) | |
| | iii) | |
| **Q. 4** | **Answer any TWO of the following** | **08** |
| | i) | |
| | ii) | |
| | iii) | |
| **Q. 5** | **Answer any ONE of the following** | **08** |
| | i) | |
| | ii) | |

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# पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ, सोलापूर
**Punyashlok Ahilyadevi Holkar Solapur University, Solapur**
केगाव, सोलापूर - ४१३ २५५, महाराष्ट्र (भारत)
दुरध्वनी क्र. ०२१७-२७४४७७८ / ११३/११५ (११ लाईन्स), फॅक्स : ०२१७-२३५१३००,
संकेतस्थळ: http://su.digitaluniversity.ac.in ई-मेल:, registrar@sus.ac.in bos@sus.ac.in

पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ
।। विद्या संवर्धना ।।
NAAC Accredited-2015
'B' Grade (CGPA 2.62)


## अभ्यासमंडळे विभाग

जा.क्र.पुअहोसोविसो/अमंवि/२०२१/ 1722 दि. 23 FEB 2021

प्रति
**मा. प्राचार्य/प्राचार्या/संचालक**
कला, वाणिज्य आणि विज्ञान
सर्व संलग्नित महाविद्यालये/सर्व संकुले
पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ, सोलापूर

**विषय : कला, वाणिज्य आणि विज्ञान विद्याशाखेतील सर्व पदवी अभ्यासक्रमांच्या प्रथम वर्षास English (Compulsory) या विषयाचा एकच पाठयक्रम लागू असल्याबाबत.**

संदर्भ : १) मा. प्राचार्य, ग्रीनफिंगर्स कॉलेज ऑफ कॉम्प्युटर ॲन्ड टेकनॉलॉजी, यशवंतनगर-अकलूज यांचे जा.क्र.जीएफसीसीटी/५५ आणि ५६ दि.२४/११/२०२० रोजीचे दोन पत्र.
२) मा. अध्यक्ष, इंग्रजी अभ्यासमंडळ यांचे दि.०१/०२/२०२१ रोजीचे ई-मेल.
३) अभ्यासमंडळे विभागाची दि.०९/०२/२०२१ रोजीची मान्य टिपणी.

महोदय/महोदया,

उपरोक्त विषयास अनुसरून आपणास आदेशान्वये कळविण्यात येते की, प्रस्तुत विद्यापीठ संलग्नित कला, वाणिज्य आणि विज्ञान विद्याशाखेतील सर्व पदवी अभ्यासक्रमांच्या प्रथम वर्षास English (Compulsory) या विषयाचा एकच पाठयक्रम लागू राहील.

सबब, शैक्षणिक वर्ष २०२०-२१ पासून English (Compulsory) "LITERARY VOYAGE" हा पाठयक्रम विद्यापीठ संलग्नित कला, वाणिज्य आणि विज्ञान विद्याशाखेतील सर्व पदवी अभ्यासक्रमांच्या प्रथम वर्षास लागू राहील, याची कृपया नोंद घ्यावी. सदर बाब महाविद्यालयाच्या मा. प्राचार्यांनी त्यांच्या अधिपत्याखाली कार्यरत असलेल्या सर्व संबंधितांच्या निदर्शनास आणून द्यावी, ही विनंती.

आपला विश्वासू,

(डॉ. सु. नं. कांबळे)
उपकुलसचिव

# PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR


**Name of the Faculty: Faculty of Humanities**

**Syllabus, Name of the Course: B.A., B.Com. and B. Sc. Part I**

## Compulsory English

**With effect from June 2020-21, 21-22, 22-23**

**Preamble :**

English is the secondary language introduced as the compulsory subject at B.A., B.com and B. Sc. Part I. The text prescribed for the syllabus is divided into four sections. It includes prose, poetry, grammar and communication skills. The prose and poetry section aim to strengthen students' reading as well as comprehension skills and give them an opportunity to develop literary sensibility and taste. The section on grammar and vocabulary provides brief, useful guidelines on the form and the function of language. The section on communication skills includes topics on useful oral and written communication necessary in the present global scenario.

1) **Objectives of the Course:**

- To introduce to the students various forms of communication.
- To make the teaching of English more practical and student centric.
- To introduce to the students poems from across the globe.
- To acquaint the students with different forms of prose.
- To acquaint the students with different language skills.

2) **Outcome** : At the end of the course students will

- Understand the concepts of communication.
- Expand their vocabulary after reading the prescribed texts.
- Attain writing, speaking, reading, & listening competence.
- Be aware of the correct usage of English grammar
- Become familiar with selected literary forms, develop and strengthen their imaginative ability and the ability to analyze different literary forms.

**Title of the Course/Paper**

**(Compulsory English)**

**Semester I and II**

**[Credits: 4 ]**

**Unit no: 1** Prose(Credit 01)**(15)**

**Unit no: 2** Poetry

**Unit no: 3** Grammar (Credit for Unit 2 and 3: 01) **(15)**

**Unit no. 4** Communication Skills (Credit for Unit 4: 02) **(30)**

**List of Reference Books:**

1. Prescribed Text Book
2. **"A Student's Introduction to English Grammar" by Rodney Huddleston and Geoffrey K. Pullum. 2002.**

**Equivalent Subject for Old Syllabus**

| Sr. No. | Name of the Old Paper | Name of the New Paper |
|---|---|---|
| 1) | Compulsory English | Compulsory English |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern (for B.A., B. Com. and B.Sc. I)

**B. A. –I (Semester I and II)**

**ENGLISH (Compulsory) Revised Syllabus (CBCS)**

**(Introduced from June 2020)**

**Que.1 Rewrite the following by choosing the correct alternative. (08)**

**(Poems, Prose and Grammar)**

**Que.2 Write the answers in short. (Any Four out Six) (12)**

**( Prose and Poetry )**

**Que.3 Broad question (any one) (10)**

**(Communication Skills)**

**Que. 4 Broad question General topics (10)**

**(Communication Skills)**

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

**B. A. –I**
**(Semester I and II)**
**ENGLISH (OPTIONAL)**
**Revised Syllabus (CBCS)**
**(Introduced from June 2020)**
**INTRODUCTION TO ENGLISH LITERATURE**
**PAPER NO. I**
**(2020-2021)**

**Preamble:** Introduction to English Literature and Language paper is introduced to B.A. –I (Optional) students for the 1st and 2nd semester with the aim to introduce students to various literary forms in English literature and language. The Poems and Short Stories, One Act Plays and Literary Terms prescribed for the syllabus will help them to develop interest in reading English literature written worldwide.

**2) Objectives of the Course:**

- To acquaint students with literary forms and literary terms.
- To initiate students and provide them a firsthand experience of reading and interpreting literary texts.
- To acquaint students with structural and analytical techniques in poetry.
- To acquaint students with analysis of minor literary form i.e. short stories and one act plays.

3) **Outcome :** At the end of the course students will be

- Familiar with the various forms of the literature
- Able to analyze the forms of literature
- Able to interpret the text

**Semester: I**

**Introduction to English Literature (Poems and Short stories)**

**General Topic:**

- Elements of Short Story.
- Forms of Poetry.

**Poems:**

| | |
|---|---|
| 1) Robert Frost - | Mending Wall |
| 2) Maya Angelou | Caged Bird |
| 3) Rabindranath Tagore | Where the Mind is Without Fear |
| 4) Elizabeth Barrett Browning | How Do I Love Thee? (Sonnet 43) |
| 5) Percy Bysshe Shelley | Ozymandias |

**Short Stories:**

1) Arthur Conan Doyle - The Crooked Man
2) Anton Chekhov: The Beggar
3) Leo Tolstoy The Three Questions
4) R. K. Narayan Engine Trouble

**Semester: II**

**Introduction to English Literature**

**(One Act Plays and Literary Terms)**

**1. General Topics:**

**• The Elements of One Act Play.**

**2. One Act Play:**

a. A Marriage Proposal – Anton Chekov
b. The Boy Comes Home – A. A. Milne
c. The Monkey's Paw – W. M. Jacobs
d. The Man with a Flower in His Mouth – Luigi Pirandello

**3. Literary Terms:**

a. Simile
b. Metaphor
c. Imagery
d. Personification
e. Contrast
f. Allegory
g. Narrative Technique
h. Symbolism
i. Soliloquy
j. Monologue
k. Setting

**Reference Books:**

1. Masks- One Act Plays by D. S. Maini.
2. Glossary of Literary Terms by M. H. Abrahms

**Introduction to English Literature**
**Total Theory Lectures 60**

**Semester I**

**Unit 1** **Credit 01** **No. of Lectures 15**
**General Topics:**

**Unit 2**
**Credit 1.5** **No. of Lectures** 22
**Poems:**

| | |
|---|---|
| 1) Robert Frost - | Mending Wall |
| 2) Maya Angelou | Caged Bird |
| 3) Rabindranath Tagore | Where the mind is Without Fear? |
| 4) Elizabeth Barrett Browning | How Do I Love Thee? (Sonnet 43) |
| 5) Percy Bysshe Shelley | Ozymandias |

**Unit 3** **Credit 1.5** **No. of Lectures 23**

**Short Stories:**

| | |
|---|---|
| 1) Arthur Conan Doyle - | The Crooked Man |
| 2) Anton Chekhov: | The Beggar |
| 3) Leo Tolstoy | The Three Questions |
| 4) R. K. Narayan | Engine Trouble |

**Semester: II**
**Introduction to English Literature**
**(One Act Plays and Literary Terms)**

**Unit 1** **Credit 01** **No. of Lectures 15**

**One Act Play:**

a. A Marriage Proposal – Anton Chekov

b. The Boy Comes Home – A. A. Milne

c. The Monkey's Paw – W. M. Jacobs

d. The Man with a Flower in His Mouth – Luigi Pirandello

**Unit 2** **Credit 1.5** **No. of Lectures 22**

**General Topic:**

• Define One Act Play and discuss the elements of the One Act Play.

**Unit 3** **Credit 1.5** **No. of Lectures 23**

**Literary Terms:**

a. Simile

b. Metaphor

c. Imagery

d. Personification

e. Contrast

f. Allegory

g. Narrative Technique

h. Symbolism

i. Soliloquy

j. Monologue

k. Aside

l. Setting

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester I and II)**

**ENGLISH (OPTIONAL) Revised Syllabus (CBCS)**

**(Introduced from June 2020)**

**Que.1 Rewrite the following by choosing the correct alternative. (08)**

**Sem I (Poems, Short stories) Sem II ( One act plays)**

**Que.2 Write the answers in short. (Any Four out Six) (12)**

**SemI (Poems) Sem – II ( literary terms)**

**Que.3 Broad question (any one) (10)**

**Sem (Short Stories) Sem II ( One Act Plays)**

**Que. 4 Broad question on General topic (10)**

**B.A.(Part-I) LINGUISTICS (Optional)**

**Title: - Introduction to Linguistics (Semester I & II)**

(With effect from 2020-2021)

**Preamble :** The paper 'Introduction to Linguistics' is introduced at BA (Part I ) for semester I & II as an optional paper of Linguistics with an aim to introduce students with the basic knowledge of Linguistics and more specifically it is an introduction of 'Linguistics' as an independent subject. The components in the syllabus will cope with the present need of the students in the socio-educational scenario.

**Course Objectives:**

- To introduce Linguistics as a discipline of knowledge.
- To familiarize students with basics of linguistics and the key concepts.
- To make students aware of the nuances of English Language
- To enable students to use English language with proper pronunciation
- To equip students with good communication skills in English

**Course Outcome:**

At the end of the course, the students will be able to-

- Define Linguistics as a separate discipline
- Explain the basic concepts in Linguistics
- Use English with proper pronunciation as per RP
- Communicate efficiently in English

**Semester-I (Paper No. I) (Lectures - 60)**

**Title of the Paper: Introduction to Linguistics**

## Unit I - Language and Linguistics (30 Lectures)

1.1 Language and its definitions

1.2 Characteristics of human language

1.3 Animal communication system and human language

1.4 What is Linguistics: synchronic and diachronic approaches

1.5 Introduction to branches of linguistics: Phonetics, Phonology, Morphology, Syntax, Semantics and Pragmatics

## Unit II - Phonetics and Phonology (30 Lectures)

2.1 Phonetics and Phonology

2.2 Articulatory Phonetics

2.3 Initiation, Phonation and articulation

2.4 Description of speech sounds of English: Consonants and Vowels

2.5 Transcription (Phonemic) of words with stress, minimal pairs, CV structure of syllables

**Semester-II (Paper No. II) (Lectures - 60)**

**Title of the Paper: Introduction to Linguistics**

## Unit III- Linguistics of words (45 Lectures)

3.1 Morphological Approach:

- 3.1.1 What is Morphology?
- 3.1.2 Morpheme and its types, Allomorphs
- 3.1.3 Word formation Processes: Major and Minor.
- 3.1.4 Morphological Analysis of Words (labeled tree diagram)

3.2 Semantic Approach:

- 3.2.1 What is Semantics?
- 3.2.2 Lexical relation: synonyms and antonyms

3.3 Syntactic Approach:

- 3.3.1 What is Syntax?
- 3.3.2 Words: Open class words and closed class words

## Unit IV - The Basic Skills of Language Learning (15 Lectures)

4.1 Listening Skill, Speaking Skill, Reading Skill and Writing Skill

4.2 Types and Ways to Improve L/S/R/W

## Books Recommended


- Bikram K. Das (Orient Longman)*Functional Grammar and Spoken and Written Communication in English*
- V. R. Narayana Swami (Orient Longman)*Strengthen your writing*
- Patil, Valke, Thorat and Merchant. (Macmillan)*English for Practical Purposes*
- ArunaKoneru*English Language Skills*
- Verma and Krishnaswamy; *Modern Linguistics; An Introduction*
- Crystal, David: *A Course in Modern Linguistics.*
- Balasubramanian, T:*A Textbook of English Phonetics for Indian Students*
- Bansal and Harrison *: Spoken English for India*
- Quirk, R. and S. Greenbaum: *A University Grammar of English*
- Lyons, John: *Language and Linguistics*
- Palmer: *Semantics*
- Jones, Daniel: *English Pronouncing Dictionary*
- Leech Geoffrey: *English Grammar for Today.*

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester I ) Paper I**

**(Introduced from June 2020)**

**(Linguistics (Optional )**

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| | | |
|---|---|---|
| **Q1** | **Multiple type questions to be set on the syllabus topic2** | |
| | **(Unit 2 Phonetics and Phonology)** | **Marks 8** |
| **Q2** | **Short answer type questions (practical type questions) to be set on the syllabus topic2** | |
| | **(Unit 2 Phonetics and Phonology)(4out of6)** | **Marks12** |
| **Q3 A** | **Broad answer type question with an internal option (A or B) to be set on the syllabus topic 1** | |
| | **(Unit 1 Language and Linguistics)** | **Marks 10** |
| **Q4** | **A broad question on the syllabus topic 1** | |
| | **(Unit1 Language and Linguistics)** | **Marks 10** |

**PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR**

# Question Paper pattern

**B. A. –I (Semester II) Paper II**

**(Introduced from June 2020)**

**(Linguistics (Optional)**

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**Q1 Multiple Choice type questions to be set on the syllabus topic3**

**(Unit 3 Linguistics of Words) Marks 8**

**Q2 Short answer type questions (practical type questions) to be set on the syllabus topic3**

**(Unit 3 Linguistics of Words) (4out of 6) Marks12**

**Q3 A broad answer type question with an internal option (A or B) to be set on the syllabus topic 3**

**(Unit 3 Linguistics of Words) Marks 10**

**Q4 A Broad question on the syllabus topic 4**

**(Unit4 Basic Skills of Language Learning) Marks 10**

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# Solapur University, Solapur
## B.A /B. Sc. Part–III
## English (Compulsory)
## Text Prescribed: Literary Quest
## Semester V&VI
## (Teaching Years: 2018-19, 2019-20, 2020-2021)
## (CBCS Semester Pattern Syllabus *w.e.f.* June, 2018)

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**Preamble:**

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. One of the critical links among human beings and an important thread that binds society together is the ability to share thoughts, emotions and ideas through various means of communication: both verbal and non-verbal. In the context of rapid globalization and increasing recognition of social and cultural pluralities, the significance of clear and effective communication has substantially enhanced.

The present course hopes to address some of these aspects through an interactive mode of teaching-learning processes and by focusing on various dimensions of communication skills. Some of these are: Language of communication, various speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note-taking etc.

This textbook presents balanced treatment of both the theory and applications of communication. Content includes strong coverage of ethics, cross-cultural communication and the newest technological influences in communication. Unique prose and poems are provided. Coverage of listening skills, intercultural communication, developing PowerPoint presentations, and writing instructions has been extensively enhanced. This book captures the dynamics of communication. It presents the subject in a fascinating way, powerfully stimulating and motivating readers. This book will give the foundation for excellent, effective, and practical communication and will definitely satisfy the literary quest of students.

**Objectives:**

- To enhances the skills of reading, writing, speaking and listening
- To teach the students various skills in class and tests these skills for a constant monitoring of their proficiency
- To broadens the horizon of understanding with the help of prose and poems
- To enhances the creativity of the student.
- To gives them a composite view of good communication.

**Course outcomes:**

By the end of the course students will

- Be competent and proficient to communicate properly
- Understand the social commitment and value of good communication
- Be creative and will try his hands in writing from time to time
- Be a good communicator


# Solapur University, Solapur

## B . Sc.- III (Chemistry)
## CBCS Syllabus
## 2018-2019

## General Structure

**Theory Examination:**

- Structure of B.Sc. course under faculty of science has total 06 semesters for 3 years.
- B.Sc.-III comprises of total two semesters (Sem-V and Sem-VI).
  Each semester will have Five theory papers (one compulsory English and four Chemistry papers) of 70 marks each (University external examination) and 30 marks for each paper ( Internal examination)
  The duration of each University theory paper examination will be of 2 hr. and 30 min.
  Each theory paper has 30 marks for internal examination. There will be 15 marks unit test and 15 marks home assignment
- At the end of academic year i.e. semester - VI the practical examination will be conducted.

The Weightage of practical is of 280 marks for University external practical examination and 120 i.e (30*4) marks for internal practical examination.

**There will be Four theory papers in chemistry of 70 marks for each semester. There titles and marks distribution are as under (Excluding English).**

| Semester | Paper No. | Title of Paper | Lectures/ Practicals per week | Total Marks | | | Total Credit |
|---|---|---|---|---|---|---|---|
| | | | | Univ. Exam | Internal Exam | Total | |
| **Semester -V** | IX | Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | X | Inorganic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XI | Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XII DSE-1 | Analytical And Industrial Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XII DSE-2 | Methodology and materials of industrial importance | | | | | |
| **Semester -VI** | XIII | Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XIV | Inorganic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XV | Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XVI DSE-1 | Analytical and Industrial Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XVI DSE-2 | Applied Organic Chemistry | | | | | |
| Theory | | | | 560 | 240 | 800 | 24 |
| Practicals | | | 20 | 280 | 120 | 400 | 20 |
| **Total B.Sc.-III** | | | | **840** | **360** | **1200** | **44** |

## Practical Course

**Practical Examination will be held at the end of the year.**

**A) Distribution of marks :**

- **Continuous Internal Assessment for chemistry**:

1) Practical paper has 30*4=120 marks for internal examination.
2) Practical paper has 280 marks for external university practical examination.
   There will be three practicals, one from each Physical, Inorganic and Organic practical work.
3) The mark distribution of 280 marks for external university practical examination is as follows.

Q. 1 Physical Chemistry experiment : 90 marks
Q. 2 Inorganic Chemistry experiment : 100 marks
Q. 3 Organic Chemistry experiment : 90 marks

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Total marks: 280 marks

**Duration of practical examination is three days, six and half hours per day**
**All answer sheets should be collected at the end of examination.**

## Practical Marks Distribution

- **Physical Chemistry experiment: 90 marks**

a) **Instrumental : 40**
b) **Non-instrumental** : 30
c) **Journal : 10**
d) **Oral : 10**

- **Inorganic Chemistry experiment: 100 marks**

a) **Gravimetric analysis : 35**
b) **Volumetric analysis : 25**
c) **Preparation : 20**
d) **Journal : 10**
e) **Oral : 10**

- **Organic Chemistry experiment: 90 marks**

a) **Organic Mixture Separation and analysis: 35**

b) **Volumetric analysis : 25**

**OR**

b) **Preparation :25**
0c) **Derivative : 10**
d) **Journal :10**
e) **Oral : 10**

## Theory

**N. B.**

i.) Figures shown in bracket indicates the total number of contact hours required for the respective topics

ii) The question paper should cover the entire syllabus. Marks allotted should be in proportion to the number of contact hours allotted to respective topics.

iii) All topics should be dealt with S.I units.

iv) Use of scientific calculator is allowed.

v) Industrial tour is prescribed.

vi) Values required for spectral problems should be provided in the question paper.

## SEMESTER –V

## PAPER-IX : PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Phase Equilibria.** **[10]**

1.1 Introduction

1.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in the equation.

1.3 Phase diagram, true and metastable equilibria.

1.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism.

1.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisation of lead (ii) Formation of compound with congruent melting point ($FeCl_3$ - $H_2O$)

**2. Electromotive force.** **[23]**

**(Convention : Reduction potentials to be used)**

2.1 Introduction

2.2 Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms of activities.

2.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emf equation for,

i) Metal - metal ion electrode. ii ) Amalgam electrode.

iii) Metal - insoluble salt electrode. iv) Gas - electrode.

v) Oxidation - Reduction electrode.

2.4 i) Reversible and Irreversible cells.

ii) Chemical cells without transference.

iii) Concentration cells

a. Electrode concentration cell

I) Reversible to cation

II) Reversible to anion

b. Electrolyte concentration cells without transference

2.5 Equilibrium constant from cell emf, determination of the thermodynamic parameters such as $\Delta G$, $\Delta H$ and $\Delta S$.

2.6 Applications of emf measurements :

i) Determination of pH of solution using Hydrogen electrode.

ii) Solubility and solubility product of sparingly soluble salts (based on concentration cell).

2.7 Numerical problems.

**3. Photochemistry.** **[12]**

3.1 Introduction

3.2 Difference between thermal and photochemical processes.

3.3 Laws of photochemistry : Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark - Einstein law.

3.4 Quantum yield, Reasons for high quantum yield (e.g. $H_2$ - $Cl_2$) and low quantum yield. ( e.g. Decomposition of HI and HBr).

3.5 Photosensitized reactions - Dissociation of $H_2$, Photosynthesis.

3.6 Photodimerisation of anthracene.

3.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence and phosphorescence.

3.8 Chemiluminescence.

3.9 Numerical problems.

***Reference Books:***


1. Physical Chemistry by G. M. Barrow, International student Edition, Mc Graw Hill.
2. University General Chemistry by C.N.R. Rao, Macmillan.
3. Physical Chemistry by, R. A. Alberty, Wiley Eastern Ltd.
4. The Elements of Physical Chemistry by P. W. Atkins, Oxford.
5. Principles of Physical Chemistry by S. H. Maron, C. H. Prutton, 4th Edition.
6. Fundamentals of Photochemistry by K.K. Rohatgi-Mukerjee.
7. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
8. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Ltd.
9. Elements of Physical Chemistry by D. Lewis and S. Glassture (Macmillan).
10. Principles of Physical Chemistry by Maron and Lando (Amerind).
11. An Introduction to Electrochemistry by S. Glasstone.
12. Physical Chemistry by W. J. Moore.
13. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).


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## PAPER -X: INORGANIC CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Metal Ligand Bonding in Transition Metal Complexes : [13]**

A) **Crystal Field Theory (CFT).**

1.A.1) Introduction - What is CFT?

1.A.2) Basic concept of CFT.

1.A.3) Formation of complexes with Crystal field splitting of 'd' orbitals

i. Shapes of d orbitals and their electron density region

ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): $[CoF6]^{3-}$, $[Co(NH_3)_6]^{3+}$.

iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g. $[CoCl_4]^{2-}$

iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co(CN)_4]^{2-}$

1.A.4. Jahn - Tellar distortion.

1.A.5. Factors affecting the Crystal - field splitting.

1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only.

1.A.7. Applications and limitations of CFT.

**B) Molecular Orbital Theory (MOT).**

1.B.1. Introduction.

1.B.2. Basic concept

1.B.3. Symmetry classes of atomic orbitals

1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedral complex.

1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$ , $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$

1.B.6. Applications and limitations of MOT.

1.B.7. Comparison between CFT and MOT.

**2. Nuclear Chemistry: [12]**

2.1. Nuclear reaction and energetics of nuclear reactions.

2.2. Classification of nuclear reactions and Types of nuclear reactions:

i) Artificial transmutation.

ii) Artificial radioactivity.

iii) Projectile capture reaction.

iv) Projectile capture - particle emission reaction.

v) Nuclear fission.

vi) Nuclear fusion.

2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb.

2.4. Applications of radioisotopes as tracers.

i) Chemical investigation - Esterification.

ii) Structural determination - Phosphorus pentachloride.

iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood.

iv) Age determination - Dating by $^{14}C$.

**3. Bioinorganic Chemistry: [08]**

3.1. Essential and trace elements in biological process.

i) Essential elements a) Macro / major elements b) Micro/trace/minor elements

ii) Non-essential elements

3.2. Metalloporphyrins with special reference to haemoglobin and myoglobin.

i) Structure of Haemoglobin (Hb)

ii) Structure of Myoglobin (Mb)

iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs to tissues

iv) Function of Haemoglobin as Carry back $CO_2$ to lungs

v) Co-operativity

vi) Oxygen binding curve

vii) Difference between Haemoglobin (Hb) and Myoglobin (Mb)

3.3. Role of alkali and alkaline earth metal ions with special reference to $Na^+$ , $K^+$ and $Ca^{2+}$.

i) Role of $Na^+$ and $K^+$

ii) Role of $Ca^{2+}$ .

**4. Catalysis [06]**

4.1. Introduction

4.2. Classification of catalytic reactions : Homogeneous & Heterogeneous

4.3. Types of catalysis

4.4. Characteristics of catalytic reactions

4.5. Mechanism of catalysis :

i) Intermediate compound theory

ii) Adsorption theory.

4.6. Industrial Applications of Catalysis.

**5. Fertilizers [06]**

5.1. Nutrient Functions in plant growth :

Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency.

5.2. Definition and qualities of an ideal fertilizers:

5.3. Classification or types of fertilizers:

5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammonium phosphate.

5.5. Mixed fertilizers, Compound or complex fertilizers.

5.6. Pollution caused by fertilizers:

**(Reference Material : Industrial Chemistry, By – B K Sharma, Goel Publishing House 16th Edition: Topic No 26, Page No. 762 to 808)**

**Reference Books:**


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford,Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan (S Chand)
23. Selected Topics in inorganic chemistry by W U Malic, G. D. Tuli, R. D. Madan. (S. Chand)
24. Industial chemistry part I and II by A. K. De
25. Industrial chemistry by B. K. Sharma

# Paper – XI: Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1 Spectroscopic Methods.** **[20]**

**1.1. Infrared Spectroscopy :**

1.1.1 Introduction.
1.1.2 Principle of IR spectroscopy.
1.1.3 Double beam IR spectrophotometer- Schematic diagram.
1.1.4 Fundamental modes of vibrations.
1.1.5 Types of vibrations.
1.1.6 Hooke's law.
1.1.7 Factors affecting values of vibrational frequencies.
1.1.8 Conditions for absorption of radiation and selection rule.
1.1.9 Fundamental group regions of IR spectrum.
1.1.10 Functional group region, Finger print region, Aromatic region.
1.1.11 Characteristic absorption of various functional groups.
1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups, spectral problems based on IR.

**1.2 NMR Spectroscopy**.

1.2.1 Introduction.
1.2.2. Proton magnetic resonance ($^1$H) spectroscopy (PMR).
1.2.3 Principles of PMR spectroscopy.
1.2.4 Magnetic and non-magnetic nuclei.
1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance.
1.2.6 NMR - Instrument. Schematic diagram.
1.2.7. Shielding and deshielding effect.
1.2.8. Chemical shift, measurement of chemical shift by delta scale and tau scale.
1.2.9. TMS as reference. Advantages of TMS.
1.2.10. Peak area (integration).
1.2.11. Spin - spin splitting (n + 1 rule).
1.2.12. Definition of coupling constant (J value) of first order coupling.
1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone, benzaldehyde, propanoic acid and benzoic acid.
1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to be given).

**1.3 Mass spectroscopy.**

1.3.1 Introduction.
1.3.2 Theory of mass spectroscopy
1.3.3 Mass spectrometer - schematic diagram
1.3.4 Formation of ions by ionization
1.3.5 Types of ions with examples.
1.3.6. Applications of mass spectroscopy.
i) Determination of molecular weight.
ii) Determination of molecular formula.

**2. Stereochemistry.** **[07]**

2.1 Introduction.
2.2 Baeyer's strain theory.
2.3 Theory of strainless rings.
2.4 Conformation and stability of cyclohexane and monosubstituted cyclohexanes - methyl cyclohexane.
2.5 Locking of conformation in t-butyl cyclohexane.
2.6 Stereoselective and stereospecific reactions :
i) Stereochemistry of addition of halogens to alkenes : syn and anti addition. Example - Addition of bromine to 2-butene. (mechanism not expected)
ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol (Example of $SN^2$ reaction)

**3. Name reactions.** **[10]**

Mechanism and applications of following reactions :
3.1 Stobbe condensation.
3.2 Oppenauer oxidation.
3.3 Meerwein Ponndorf Verley reduction.
3.4 Reformatsky reaction.
3.5 Wagner - Meerwein Rearrangement.
3.6 Hofmann rearrangement reaction.
3.7 Wittig reaction.
3.8 Related problems.

**4. Organic synthesis via Enolates** **[08]**

4.1 Introduction - Reactive methylene group.
4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocyclic compound.
4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic acid, α- β- unsaturated acid, α-amino acid and heterocyclic compound.

***Reference Books :***


1) Organic Chemistry : D. J. Cram and G. S. Hammond, McGraw Hill book Company, New York.
2) Organic Chemistry : I. L. Finar, The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry : Peter Sykes, Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry : R. T. Morrison and R. N. Boyd, Prentice Hall of India Private Limited, New Delhi. 6th Edition.
5) Text book of organic Chemistry : L. N. Ferguson, N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III: S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Eastern, Limited, New Delhi.
7) A text book of organic Chemistry : K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry : Arun Bahl and B. S. Bahl , S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism : Raj K. Bansal , Wiley Easter Ltd., New Delhi.
10) Reaction Mechanism and Reagents in Organic Chemistry: G. R. Chatwal, Himalaya Publishing House, New Delhi.
11) Stereochemistry conformation and mechanism: P. S. Kalsi, New Age International Publishers, 4th Edition.
12) Organic Chemistry Volume I and II : I. L. Finar ELBS with Longman 6th Edition.
13) Organic Chemistry Volume I and II : William Kemp, ELBS with Mc. Million 3rd Edition.
14) Advanced Organic Chemistry: Jerry March, Wiley Eastern Ltd.
15) Spectroscopy of Organic compounds: P. S. Kalsi.

16) Modern Methods of Organic Synthesis, W Carruthers, Iaon Coldhalm, Cambridge University Press
17) Organic Chemistry : Fieser and Fieser.
18) Principles of Organic Chemistry : English and Cassidy.
19) Elementary Organic Absorption Spectroscopy : Y. R. Sharma.
20) Spectroscopy : V. M. Parikh.
21) Stereochemistry of Carbon Chemistry : Eliel.
22) Principles of Organic Chemistry : M. K. Jain.
23) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
24) Organic Chemistry : A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
25) Reactions, Rearrangements and reagents : S.N.Sanyl, Bharati Bhawan publishers and Distributors Patna.

## PAPER-XII : (DSE-1)
## ANALYTICAL AND INDUSTRIAL PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Colorimetry.** **[08]**

1.1 Introduction

1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law.

1.3 Classification of methods of color measurement or comparison, Photoelectric photometer method - single cell photo-electric colorimeter.

**2. Potentiometry** **[10]**

2.1 Introduction.

2.2 Detail study of calomel, quinhydrone and glass electrodes and their use in determination of pH.

2.3 Basic circuit diagram of direct reading potentiometer

2.4 Potentiometric titrations : Classical and analytical methods for locating end points,

i) Acid - Base titrations.

ii) Redox - titrations.

iii) Precipitation titrations.

2.5 Advantages of potentiometric titrations.

**3 Electroplating** **[08]**

3.1 Introduction.

3.2 Electrolysis, Faraday's laws, Cathode current efficiency.

3.3 Basic principles of electroplating, cleaning of articles.

3.4 Electroplating of Nickel and Chromium.

3.5 Anodising.

**4 Flame photometry** **[09]**

4.1 General principles.

4.2 Instrumentation : Block diagram,
Burners: Total consumption burner, premix or laminar-flow burner and Lundergraph burner,
Mirrors,
Slits,
Monochromators,
Filters
Detectors.

4.3 Applications in qualitative and quantitative analysis.

4.4 Limitations of flame photometry.

**5. Conductometry:** **[10]**

5.1 Basic circuit of D.C. Wheatstone bridge, Measurement of conductance by Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molar conductance.

5.2 Conductometric acid-base titrations

i. Strong acid against strong base

ii. Strong acid against weak base

iii. Weak acid against strong base.

iv. Weak acid against weak base.

5.3 Advantages of conductometric titrations

***Reference Books :***


1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rd Edition).
2. Instrumental methods of Chemical analysis by Willard, Merit and Dean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (Himalaya Publication).
4. Principles of electroplating and eletroforming by Blum and Hogaboom, Mac Graw - Hill Book Co. 3rd Edn.
5. Vogel's text book of Quantitative Inorganic Analysis by Basssett and Denny etc. ELBS and Longman 4th Edition.
6. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
7. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
8. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
9. Principles of Physical Chemistry by Maron and Lando (Amerind).
10. An Introduction to Electrochemistry by S. Glasstone.
11. Physical Chemistry by W. J. Moore.
12. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).


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# PAPER-XII : (DSE-2)
# METHODOLOGY AND MATERIALS OF INDUSTRIAL IMPORTANCE

**Total Credits: 3**
**Contact hrs: 45**

**1. Data Analysis (13 Lectures)**

1.1 The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments.
1.2 Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests.
1.3 Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals,
1.4 General polynomial fitting, linearizing transformations, exponential function fit, 'r' and its abuse.
1.5 Basic aspects of multiple linear regression analysis.

**2. Chemical Safety and Ethical Handling of Chemicals: (12 Lectures)**

2.1 Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation.
2.2 Safe storage and use of hazardous chemicals,
2.3 Procedure for working with substances that pose hazards, flammable or explosive hazards,
2.4 Procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals,
2.5 Procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system.
2.6 Incineration and transportation of hazardous chemicals.

**3. Nanomaterials: (10 Lectures)**

3.1 Overview of nanostructures and nanomaterials: classification.
3.2 Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control.
3.3 Carbon nanotubes and inorganic nanowires.
3.4 Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials,
3.5 Bionano composites.

**4. Composite materials: (10 Lectures)**

4.1 Introduction, limitations of conventional engineering materials, role of matrix in composites,
4.2 Classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites.
4.3 Environmental effects on composites.
4.4 Applications of composites.

**Reference Books**

1) Practical skills in chemistry, Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) 2nd Ed. Prentice-Hall, Harlow.
2) Data analysis for chemistry, Hibbert, D. B. & Gooding, J. J. (2006) Oxford University Press.
3) Errors of observation and their treatment, Topping, J. (1984). Fourth Ed., Chapman Hall, London.
4) Quantitative chemical analysis, Harris, D. C. 6th Ed., Freeman (2007) Chapters 3-5.
5) How to use Excel in analytical chemistry and in general scientific data Analysis, Levie, R. de, Cambridge Univ. Press (2001) 487 pages.
6) Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
7) Inorganic Solids: An introduction to concepts in solid-state structural Chemistry, Adam, D.M. John Wiley & Sons, 1974.
8) Introduction to Nanotechnology, Poole, C.P. & Owens, F.J. John Wiley & Sons, 2003.

## SEMESTER-VI

## PAPER- XIII: PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Spectroscopy.** **[10]**

1.1 Introduction
1.2 Electromagnetic radiation.
1.3 Electromagnetic spectrum, Energy level diagram.
1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzmann distribution), determination of bond length; isotope effect. Interaction of radiation with rotating molecule.
1.5 Vibrational spectra of diatomic molecules : Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant, overtones. Interaction of radiation with vibrating molecules.
1.6 Numerical problems.

**2. Solutions.** **[09]**

2.1 Introduction
2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids.
2.3 Vapour pressure and boiling point diagrams of miscible liquids.
Type I : Systems with intermediate total vapour pressure.
(i.e. System in which B.P. increases regularly - Zeotropic)
Type II : Systems with a maximum in the total vapour pressure.
(i.e. System with a B.P. minimum - Azeotropic)
Type III :Systems with a minimum in the total vapour pressure.
(i.e. System with a B.P. Maximum - Azeotropic)
Distillation of miscible liquid pairs.
2.4 Solubility of partially miscible liquids.
(i) Maximum solution temperature type : Phenol - water system.
(ii) Minimum solution temperature type : Triethyl amine - water system.
(iii) Maximum and minimum solution temperature type : Nicotine - water system.

**3. Thermodynamics.** **[13]**

3.1 Introduction
3.2 Free energy : Gibbs function (G) and Helmholtz function (A), Criteria for thermodynamic equilibrium and spontaneity.
3.3 Relation between G and H : Gibbs Helmholtz equation.
3.4 Phase equilibria : Clapeyron - Clausius equation.
3.5 Thermodynamic derivation of law of mass action, van't Hoff isotherm and isochore.
3.6 Fugacity and activity concepts.
3.7 Numerical problems.

**4. Chemical Kinetics** **[13]**

4.1 Introduction, simultaneous reactions such as opposing reactions, side reactions, consecutive reactions and chain reactions. [Derivations of rate Equations for these reactions are not expected.]

4.2 Effect of temperature on the rate of reaction.
1. Temperature coefficient
2. Arrhenius equation
3. Energy of activation

4.3 Theories of reaction rate :
1. Collision theory and
2. Transition state theory

4.4 Third order reaction with equal concentration of all reactants, their characteristics and examples
4.5 Numerical problems.

***Reference Books :***


1. Principles of Physical Chemistry by Maron and Pruton 4th edition.
2. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
3. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
4. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
5. Principles of Physical Chemistry by Maron and Lando (Amerind).
6. Thermodynamics for chemists by S Glasstone.
7. Physical Chemistry by W. J. Moore.
8. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).
9. Basic Chemical Thermodynamics by V V Rao (McMillan)
10. An introduction to chemical thermodynamics by R. R. Mishra and R. P. Rastogi.
11. Fundamentals of molecular spectroscopy by C. N. Banwell and McCash- Tata McGraw Hill


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## PAPER-XIV: INORGANIC CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

## 1) Study of F-block Elements [11]

1.1 Lanthanides :-

I) Introduction
II) Electronic configuration
III) Occurrence
IV) Separation of Lanthanides
  i) Bulk separation methods
  ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail)

1.2 Actinides :-

I) Introduction
II) Electronic configuration
III) General Methods of preparation –
  a. Neutron-capture followed by β-decay
  b. Accelerated projectile bombardment method
  c. Heavy-ion bombardment method

1.3 IUPAC Nomenclature of the Super Heavy Elements with atomic numbers (Z) greater than 100.

## 2) Metals and Semiconductors. [11]

2.1 Introduction.
2.2 Properties of metallic solids.
2.3 Theories of bonding in metal.
  a) Free electron theory.
  b) Molecular orbital theory (Band theory).
2.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory.
2.5 Semiconductors:
  a) Types of semiconductors - intrinsic and extrinsic semiconductors.
  b) Applications of semiconductors.
2.6 Superconductors :
  a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_{7-x}$
  b) Applications of superconductors.

## 3) Structural Chemistry. [11]

3.1 Structural study of following compounds.
  i) Diborane.
  ii) Borazine.
  iii) Xenon compounds → $XeF_2$, $XeF_6$, $XeO_4$ (w.r.t. VBT only.)
3.2 Structural study of Oxides of Sulphur and Phosphorous:
  i) Oxides of Sulphur : $SO_2$ and $SO_3$
  ii) Oxides of Phosphorous : $P_4O_6$ and $P_4O_{10}$

## 4) Corrosion and Passivity. [07]

**4.1 Corrosion :-**

I. Introduction
II. Types of corrosion
III. Electrochemical theory of corrosion
IV. Factors affecting the corrosion
  i) Position of metal in emf series.
  ii) Purity of metal.
  iii) Effect of moisture.
  iv) Effect of oxygen.
  v) Hydrogen over voltage.
V. Methods of protection of metals from corrosion.

**4.2 Passivity :-**

I. Definition.
II. Types of passivity.
III. Oxide film theory.
IV. Application of passivity.

## 5. Organometallic Chemistry. [05]

5.1 Introduction - Definition,
5.2 Nomenclature of organometallic compounds.
5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be and Al.
5.4 Mononuclear carbonyl and nature of bonding in simple metal carbonyls.

## *Reference Books :*


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford, Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Organometallic Chemistry by P. L. Pauson.
23. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan
24. Selected Topics in inorganic chemistry by W U Malik, G. D. Tuli, R. D. Madan. (S. Chand)
25. Industrial chemistry part I and II by A. K. De
26. Industrial chemistry by B. K. Sharma

## Paper - XV : Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1 Heterocyclic compounds** **[09]**

1.1 Introduction and classification
1.2 Pyrrole
1.2.1 Methods of synthesis
i) From acetylene
ii) From furan
iii) From succinamide
1.2.2 Physical properties
1.2.3 Reactivity of pyrrole
i) Basic character
ii) Acidic character
iii) Electrophilic substitution with general mechanism
1.2.4 Chemical reactions
i) Reduction
ii) Oxidation
iii) Nitration
iv) Sulphonation
v) Halogenation
vi) Friedel Craft's reaction
vii) Coupling reaction

1.3 Pyridine
1.3.1 Methods of synthesis
i) From acetylene and hydrogen cyanide
ii) From piperidine
1.3.2 Physical properties
1.3.3 Chemical reactions
i) Basic character
ii) Electrophilic substitution reactions : Nitration, Sulphonation and Bromination
iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyl lithium.
1.4 Quinoline
1.4.1 Synthesis - Skraup's synthesis
1.4.2 Physical properties.
1.4.3 Reactions of quinoline
i) Electrophilic substitution reactions - Nitration and sulphonation.
ii) Nucleophilic substitution reactions – Reactions with sodamide, alkyl lithium and aryl lithium
iii) Reduction

**2. Carbohydrates** **[11]**

2.1 Introduction
2.2 Classification and nomenclature
2.3 Monosaccharide D-glucose - Open chain structure
2.4 Chain lengthening of Aldoses - Kiliani synthesis
2.5 Chain shortening of Aldoses - Weerman's reaction
2.6 Interconversion of glucose and fructose
2.7 Configuration of D-glucose from D-arabinose
2.8 Objections against open chain structure of D-glucose.
2.9 Mutarotation with mechanism.
2.10 Ring structure of D-glucose - Determination of size of ring by
i) Methylation method.
ii) Periodic acid oxidation method.
2.11 Disaccharides - Introduction, sucrose and lactose - sources, structural formulae and uses.
2.12 Polysaccharides – Introduction, Starch and Cellulose - sources, structural formulae and uses

**3. Vitamins and Hormones** **[07]**

3.1 General idea of vitamins, structure and synthesis of vitamin A
3.2 General idea of hormones, structure and synthesis of Adrenaline and Thyroxin

**4. Pharmaceuticals** **[07]**

4.1 Introduction
4.2 Qualities of ideal drug
4.3 Methods of classification of drugs - Classification based on the therapeutical action
4.4 Brief idea of pencillin-G ( constitution, synthesis not expected)
4.5 Synthesis and uses of the following drugs :

i) Antimalerials - Paludrin
ii) Antituberculars - Isoniazide and Ethambutol
iii) C. N. S. drugs - Phenobarbitone
iv) Antidiabetics - Tolbutamide
v) Anti-inflammatory drugs - Ibuprofen
vi) Antibiotics - Chloromycetin
vii)Anticancer drugs : Chlorambucil (Leukeran)

**5 Synthetic dyes.** **[07]**

5.1 Introduction, Qualities of good dye
5.2. Classification based on constitution and methods of applications
5.3 Witt's theory - Colour and constitution
5.4 Synthesis of Orange IV, Malechite green, phenolphthalein

**6 Agrochemicals.** **[04]**

6.1 General idea of agrochemicals including pyrethroides.
6.2 Synthesis and uses of the following agrochemicals :

i) Indole-3-acetic acid.
ii) Monocrotophos
iii) Methoxychlor
iv) Ethophan
v) Carbaryl
vi) Baygon

***Reference Books :***


1) Organic Chemistry - Cram D. J. and Hammond G.S. McGraw Hill book Company New York.
2) Organic Chemistry - Finar I. L. The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry - Peter Sykes Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry - R. T. Morrison and R. N. Boyd Prentice Hall of India private limited New Delhi. 6th Edition.
5) Text book of organic Chemistry - Ferguson L. N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III - S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Estern, Limited, New Delhi.
7) A text book of organic Chemistry - K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry - Arun Bahl and B. S. Bahl S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism - Raj K. Bansal Wiley Easter Ltd. New Delhi.
10) Reaction Mechanism and reagents in Organic Chemistry - G. R. Chatwal Himalaya Publishing House New Delhi.
11) Organic Chemistry Volume I and II - I. L. Finar ELBS with Longman 6th Edition.
12) Organic Chemistry Volume I and II - William Kemp ELBS with Macmillion 3rd Edition.
13) Advanced Organic Chemistry - Jerry March Wiley Eastern Ltd.

14) Organic Chemistry - Fieser and Fieser.
15) Principles of Organic Chemistry - English and Cassidy.
16) Chemicals for crop improvement and pest management - Green, Hartly and West.
17) Chemistry of pesticides - K. H. Buchel (T. W.).
18) Medical Chemistry - Burger.
19) Principles of Organic Chemistry - M. K. Jain.
20) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
21) Organic Chemistry - A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
22) Reactions, Rearrangements and reagents - S.N. Sanyl, Bharati Bhawan publishers and Distributors Patna.
23) Synthetic Organic Chemistry-Kamlesh Bansal.
24) Synthetic Organic Chemistry-Gurudeep Chatwal.
25) Chemistry of Insecticides – U.S. Sree Ramulu.
26) Medicinal Chemistry- Ashitosh Kar.

## Paper-XVI:( DSE-1)
## Analytical and Industrial Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1. Soaps and Detergents.** **[08]**

1.1 Soaps
i) Raw materials
ii) Types of soaps
iii) Manufacture of soap - Hot process
iv) Cleansing action of soaps
1.2 Detergents
i) Raw materials
ii) Types of detergents - Cationic, anionic, amphoteric, neutral detergents
iii) Preparation of teepol and deriphat
1.3 Comparison between soaps and detergents

**2. Synthetic Polymers.** **[08]**

2.1 Introduction
2.2 Classification :
i) According to origin, composition, method of preparation and general physical properties
ii) Classification based upon structure
2.3 Process of addition polymerisation - free radical polymerisation of alkenes and Dienes
2.4 Ionic polymerisation
2.5 Ziegler - Natta polymerisation
2.6 Methods of preparation and uses of :
i) Polystyrene ii) PVC iii) Phenol formaldehyde resin iv) Polyurethane
2.7 Natural rubber : General idea and vulcanisation
2.8 Synthetic rubbers : Synthesis and uses of :
i) Polychloroprene ii) Buna rubber - Buna N and Buna S

**3. Sugar and Alcohol Industry** **[09]**

3.1 Manufacture of raw cane sugar
3.2 Refining of raw sugar
3.3 White sugar
3.4 By-products of sugar industry
3.4.1 Manufacture of ethyl alcohol from molasses
3.4.2 Rectified spirit, Denatured spirit absolute alcohol and power alcohol
3.4.3 By-products of alcohol industry

**4. Synthetic Reagents** **[07]**

**4.1** Sodium borohydride: Use in reduction of aldehydes and ketones
**4.2** Lithium aluminium hydride: Use in reduction of aldehydes, ketones, acids, amides and esters
**4.3** Osmium tetroxide **:** Hydroxylation of alkenes
**4.4** 1,3-dithiane : Umpolung concept, reactions with alkyl halide and acyl halide
**4.5** Selenium dioxide : Oxidation of carbonyl compounds and allylic oxidation

**5. Green Chemistry.** **[04]**

5.1 Introduction - Twelve principles of green chemistry
5.2 PTC: Introduction, Role in organic reactions catalysis
5.3 Biocatalytic reactions - Hydroxylation and oxidation using enzymes
5.4 Introduction to microwave assisted reactions
5.5 Ionic liquids – Introduction and examples of ionic liquids

**6 Chromatography.** **[09]**

6.1 Introduction
6.2 General principles
6.3 Classification
6.4 Study of following chromatographic techniques with reference to principle, methodology and applications
i) Paper chromatography
ii) Column chromatography
iii) Thin layer chromatography
iv) Gas chromatography

***Reference) Books :***

1. Basic Concepts of Analytical Chemistry - S. M. Khopkar, Wiley Eastern Ltd., Bombay.
2. Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.
3. Text Book of Quantitative Organic Analysis - A. I. Vogel, Pearson Edn. Delhi.
4. Quantitative Organic Chemistry - A. I. Vogel, Pearson Edn. Delhi.
5. Hand Book of Organic Analysis - H. T. Clarke, Arnold Heinemann Pub. Delhi.
6. Advanced Organic Chemistry - B. S. Bahl and Arun Bahl, S. Chand Comp. Delhi.
7. Riegel's Handbook of Industrial Chemistry - J. A. Kent, Van. Nostrard, Londan.
8. Chemical Process Industries - Shreve and Brinic - Ostin, Magraw Hill, New York.
9. Analytical Chemistry- Walton.
10. Biotechnology and Applied Microbiology - Alani and Moo-Young.
11. Immobilize Biocatalysis - Joy Wleser.
12. Introduction to Polymer Chemistry - Raymond B. Seymour.
13. Polymer Science - V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar Willey Eastern Limited.
14. Advances in Green Chemistry : Chemical synthesis using MW-irradiation by R. S. Varma.
15. Green Chemistry : Environment Friendly alternatives - Rashmi Sanghi and M. M. Srivastava (Eds) (c) 2003 Narosa Publishing House, New Delhi, India.
16. Reactions, rearrangements and reagents : S. N. Sanyal
17. Organic reaction mechanism : V. K. Ahluwalia and K.R.K Parashar
18. Environment friendly synthesis using ionic liquids: Jairton Dupont, Toshiyuki Itoh and Sanjay V. Malhotra (CRC Press)

## Paper-XVI:( DSE-2)
## Applied Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

### 1. Theory of binary mixture analysis 05

1.1 Types of organic compounds, nature and types of binary mixtures.
1.2 Reactions of acid, base, phenol and neutrals with sodium bicarbonate, sodium hydroxide and hydrochloric acid
1.3 Principle of binary mixture separation.
1.4 Determination of type of the mixture
1.5 Separation of mixture- using aqueous medium and ether.

### 2. Green Chemistry 04

2.1 Introduction
2.2 Twelve principles of green chemistry
2.3 Zeolites as green catalysts
2.4 Ultrasound assisted reactions
2.5 Reactions in ionic liquids
2.6 Solvent free reactions

### 3. Chemistry of cosmetics 12

3.1 A general study including preparation and uses of- Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, cold creams, vanishing creams and shaving creams

### 4. Chemistry of perfumes 12

4.1 A general study including preparation and uses of- antiperspirants, and artificial flavours
4.2 Essential oils and their importance in cosmetic industry with reference to Eugenol, geraniol, sandalwood oil, eucalyptus oil, rose oil, 2-phenyl ethyl alcohol, jasmone, civetone and muscone

### 5. Fermentation 05

5.1 Aerobic and anaerobic fermentation
5.2 Production of antibiotics- streptomycin
5.3 Production of vitamins-Vit. B12

### 6. Textile Chemistry 07

6.1 Introduction, classification of fibers
6.2 Sizing: object of sizing, sizing ingredients and their functions
6.3 General idea of processes : singeing, desizing, scouring
6.4 Bleaching: Brief study of the outline of the process of bleaching cotton and synthetic material.
6.5 Dyeing : Study of dyeing of cellulosic material and synthetic fibers with dyes like direct, vat, reactive and disperse dyes.

**Reference Books**


1. Industrial chemistry : B. K. Sharma(Goel Publishing House, Meerut)
2. Engineering Chemistry: P. C. Jain and M. Jain(Dhanpatrai and sons, Delhi)
3. Practical Organic Chemistry: A. I. Vogel
4. Advances in green chemistry-Chemical synthesis using Microwave irradiation: R. S. Verma
5. A book of textile chemistry: A. J. Hall
6. Bleaching and Dyeing : Dr. V. Shenai
7. Sizing : D. B. Ajgaonkar
8. Chemical process industries : Shreve and Brinik (Ostin McGrawHill Publication, New York)
9. Medicinal and Pharmaceutical Chemistry: Hakishan, V. K. Kapoor (Vallabh Prakashan Pimpura New Delhi)
10. Industrial Chemistry, Vol. I:E. Stocchi (Ellis Horwood Ltd, UK)

# PRACTICALS

N. B. i. Use of Electronic balance with 0.001g accuracy is mandatory.
ii. Use of Scientific calculator is allowed.

## Physical Chemistry

**I) Non instrumental Experiments( Any Five) :**

1. To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by the distribution method.
2. To determine the partition coefficient of $CH_3COOH$ between $H_2O$ and $CCl_4$.
3. Critical Solution Temperature.
To determine the CST for phenol – water system.
4. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl.
5. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N $H_2SO_4$.
6. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Equal concentrations).
7. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Unequal concentrations).
8. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
9. To study the effect of addition of electrolyte (KCl) on the reaction between $K_2S_2O_8$ and KI (Equal concentrations).

**II. Instrumental experiments**

**A. Potentiometry (Any Three).**

1. Titration of strong acid with strong alkali.
2. Preparation of buffer solution and determination of their pH (Any five buffer solutions), - Theoretical calculation of pH values by using Henderson's equation.
3. Determination of standard electrode potential of $Zn/Zn^{++}$ , $Cu/Cu^{++}$ , $Ag/Ag^{+}$ (Any two).
4. Determination of solubility and solubility product of AgCl.
5. Titration of ferrous ammonium sulphate using $K_2Cr_2O_7$ solution and to calculate redox potential of $Fe^{++}$ , $Fe^{+++}$ system

**B. Conductometry ( any three ).**

1. Titration of weak acid with strong alkali.
2. Titration of a mixture of weak acid and strong acid with strong alkali.
3. To study the effect of substituent on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid (cell constant to be given).
4. To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometric method.

**C. Refractometry.**

1. To determine the percentage composition of unknown mixture by (i) graphical method and (ii) by composition law (Densities of pure liquids A & B be given).
2. To determine the molar refractivity of methyl acetate, ethyl acetate, n-hexane and carbon tetrachloride and calculate the refraction equivalents of C, H and Cl atoms.

**D. Colorimetry (Any Two).**

1. To verify Lambert - Beer's law using $CuSO_4$ solution.
2. To estimate $Fe^{+++}$ ions by thiocynate method.
3. To estimate $Fe^{+++}$ ions using salicylic acid by colorimetric titration.

**E. pH - metry (Any One).**

1. To determine the dissociation constant of monobasic acid (Acetic acid).
2. To determine the dissociation constant of dibasic acid (Malonic acid).

**Reference Books :**


1. Findlay's Practical Physical Chemistry (Longman)
2. Advanced Practical Physical Chemistry by J. B. Yadav, Goel publishing house.
3. Practical Physical Chemistry by B. D. Khosla, V. C. Garg (R. Chand and Co.)
4. Systematic experimental Physical Chemistry by Rajbhoj, Chandekar (Anjali Publicaiton)
5. Practical Physical Chemistry : Nandkumari, Kothari and Lavande.
6. Practical Physical Chemistry by Gurtu (S. Chand).

## Inorganic Chemistry

**I. Gravimetric Estimations (G).**

N. B. : Any two experiments from G1 to G3 and any two experiments from G4 to G7

G1. Gravimetric estimation of iron as ferric oxide from the given solution containing ferrous ammonium sulphate, copper sulphate and free sulphuric acid.

G2. Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, ferrous ammonium sulphate and free sulphuric acid.

G3. Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride, ferric chloride and free hydrochloric acid.

G4. Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate, copper sulphate and free sulphuric acid.

G5. Gravimetric estimation of barium as barium chromate from the given solution containing barium chloride, ferric chloride and free hydrochloride acid.

G6. Gravimetric estimation of Aluminium as Aluminium oxinate i.e.
tris (8-hydroxyquinolinato) aluminate (III) from a given solution containing potash alum, copper sulphate and free sulphuric acid.

G7. Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) from the given solution containing nickel sulphate, ferrous ammonium sulphate and free sulphuric acid.

[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm and asked to dilute to 100 cm (or the stock solution should be given in the range of 20 to 30 cm and asked to dilute to 250 cm ). Use 50 cm of this diluted solution for estimation.]

**II. Inorganic Preparations (P) : (any five).**

N. B. – 1. Calculations of % yield is expected.

2. After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in terms of:

a) Name of central metal ion
b) Oxidation number of metal ion
c) Nature of ligand
d) Nature of bonding
e) Type of hybridization
f) Inner orbital or outer orbital complex
g) Geometry of the complex with structure
h) Magnetic property of the compound
i) Color of the compound
j) Nature :Crystalline /Amorphous

P1. Preparation of potassium trioxalatoferrate (III)

P2. Preparation of potassium trioxalatoaluminate (III)

P3. Preparation of tris(ethylenediamine)nickel (II) thiosulphate

P4. Preparation of sodium hexanitrocobaltate (III)

P5. Preparation of ammonium diamminetetrathiocynatochromate(III) (Reineck's salt)

P6. Preparation of cholropentaamminecobalt (III) chloride

P7. Preparation of hexamminenickel (II) chloride

P8. Preparation of tris(thiourea)cuprous(I) sulphate

**III) Titrimetric Estimations :**

**A) Percentage Purity** (any three)

V1. Determination of percentage purity of ferrous ammonium sulpahte.

V2. Determination of percentage purity of tetramminecopper (II) sulphate.

V3. Determination of percentage purity of potassium trioxalatoaluminate(III).

V4. Determination of percentage purity of potassium trioxalatoferrate (III).

**B) Analysis of Commercial Sample** ( any three).

V5. Determination of percentage of magnesium in the given sample of talcum powder.

V6. Determination of amount of aluminium in the given solution of potash alum.

V7. Determination of titrable acidity in the given sample of milk or lassi.

V8. Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.

V9. Determination of percentage purity of boric acid using supplied sodium hydroxide (Standard succinic or oxalic acid solution to be prepared for standardization of the given sodium hydroxide solution.)

**C) Ion exchange method**

V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).

V11. Determination of amount of magnesium and zinc in the given solution containing ($Mg^{++}$ and $Zn^{++}$) using anion exchange resin and standard solution of EDTA.

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***Reference Books:***

1. A text book of quantitative Inorganic Analysis - A. I. Vogel.
2. Text book of Quantitative Inorganic Analysis - Kolthoff and Sandell.
3. Experimental Inorganic Chemistry - Palmer W. G.
4. Advanced Practical Inorganic Chemistry - Adams and Raynor.
5. Handbook of Preparation Inorganic Chemistry. Vol. 1 and 11 - Brauer.
6. Manual in Dairy Chemistry - I.C.A.R. Sub-Committee on Dairy Education.
7. Chemical methods for environmental analysis - R. Ramesh and M. Anbu.

# Organic Chemistry

**I) Qualitative analysis**

Separation of binary mixture and Identification of its components. 5g of mixture is to be given for separation. At least **08 mixtures** are to be separated.

Nature 1) Solid - Solid : 4 mixtures

2) Solid - Liquid : 2 mixtures

3) Liquid - Liquid : 2 mixtures

1) Solid - Solid Mixtures :

One mixture from each of the following types should be given :

i) Acid + Phenol ii) Acid + Base

iii) Acid + Neutral iv) Phenol + Base

v) Phenol + Neutral vi) Base + Neutral

2) Solid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Acid + Neutral should be given.

3) Liquid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Base + Neutral should be given.

Following compounds should be used for preparation of mixtures:

Acids : Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, Aspirin, Oxalic acid.

Phenols: α-naphthol, β-naphthol

Bases : o -nitroaniline, m-nitroaniline, p-nitroaniline, aniline, o-toluidine and N, N-dimethyl aniline.

Neutrals : Naphthalene, acetanilide, m-dinitrobenzene, chloroform, carbon tetrachloride, acetone, nitrobenzene, ethyl acetate, ethyl benzoate, acetophenone, bromobenzene, urea and thiourea.

**II) Quantitative analysis : (Any four)**

**Organic estimations** :

1) Estimation of sucrose

2) Estimation of nitro group

3) Saponification value of oil.

4) Estimation of formaldehyde from given formalin solution.

5) Estimation of acid and ester present in the given mixture of acid and ester.

6) Estimation of acid and amide from the mixture of acid and amide.

**III) Organic Preparations** : (any four)

N.B.: a) Calculation of percentage practical yield.

b) Recrystallisation of crude product and its melting point.

c) The purity of the product may be confirmed by TLC.

1) Preparation of m-nitroaniline from m-dinitrobenzene.

2) Preparation of aspirin from salicylic acid.

3) Preparation of nerolin from β-naphthol.

4) Preparation of p-iodonitrobenzene from p-nitroaniline.

5) Preparation of benzene azo - β - naphthol.

6) Preparation of benzoic acid from cinnamic acid.

**IV Preparation of Derivatives :**

N.B.:During practical course, name of the organic compound should not to be given.

1) Bromo derivative of aniline and cinnamic acid.

2) Nitro derivative of salicylic acid and nitrobenzene.

3) Benzoyl derivative of β-naphthol and aniline.

4) Picrate derivative of anthracene and β-naphthol.

5) Oxalate and nitro derivatives of urea.

6) Anhydride derivative of phthalic acid.

7) Oxime derivatives of Ketones : Acetone and acetophenone.

8) 2 : 4 DNP of acetophenone.

***Reference Books** :*

1. Practical Organic Chemistry by A. I. Vogel.

2. Hand book of Organic qualitative analysis by H. T. Clarke.

3. A laboratory Hand Book of Organic qualitative analysis and separation by V. S. Kulkarni. Dastane Ramchandra & Co.

4. Practical Organic Chemistry by F. G. Mann and B. C. Saunders. Low - priced Text Book. ELBS. Longman.

5. Experiments in General Chemistry by C. N. R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.

6. Advanced Practical Organic Chemistry by N. K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V. K. Ahluwalia, Sunita Dhingra. University Press. Distributor - Orient Longman Ltd.
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V.K. Ahluwalia, Renu Agarwal. University Press. Distributor-Orient Longmann Ltd.
9. Practical Chemistry - Physical - Inorganic - Organic and Viva - voce by Balwant Rai Satija. Allied Publishers Private Limited.30
10. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House, Mumbai.
11. College Practical Chemistry by Patel, Jakali, Mohandas, Israney Turakhia. Himalaya Publishing House, Mumbai.
12. Practice of thin layer chromatography by Joseph C. Touchstone, Murrell F. Dobbins. A Wiley - Interscience Publication John-Wiley & Sons.

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# Solapur University, Solapur

## B . Sc.- III (Chemistry)
## CBCS Syllabus
## 2018-2019

## General Structure

**Theory Examination:**

- Structure of B.Sc. course under faculty of science has total 06 semesters for 3 years.
- B.Sc.-III comprises of total two semesters (Sem-V and Sem-VI).
  Each semester will have Five theory papers (one compulsory English and four Chemistry papers) of 70 marks each (University external examination) and 30 marks for each paper ( Internal examination)
  The duration of each University theory paper examination will be of 2 hr. and 30 min.
  Each theory paper has 30 marks for internal examination. There will be 15 marks unit test and 15 marks home assignment
- At the end of academic year i.e. semester - VI the practical examination will be conducted.

The Weightage of practical is of 280 marks for University external practical examination and 120 i.e (30*4) marks for internal practical examination.

**There will be Four theory papers in chemistry of 70 marks for each semester. There titles and marks distribution are as under (Excluding English).**

| Semester | Paper No. | Title of Paper | Lectures/ Practicals per week | Total Marks | | | Total Credit |
|---|---|---|---|---|---|---|---|
| | | | | Univ. Exam | Internal Exam | Total | |
| **Semester -V** | IX | Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | X | Inorganic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XI | Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XII DSE-1 | Analytical And Industrial Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XII DSE-2 | Methodology and materials of industrial importance | | | | | |
| **Semester -VI** | XIII | Physical Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XIV | Inorganic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XV | Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XVI DSE-1 | Analytical and Industrial Organic Chemistry | 3 | 70 | 30 | 100 | 3 |
| | XVI DSE-2 | Applied Organic Chemistry | | | | | |
| Theory | | | | 560 | 240 | 800 | 24 |
| Practicals | | | 20 | 280 | 120 | 400 | 20 |
| **Total B.Sc.-III** | | | | **840** | **360** | **1200** | **44** |

## Practical Course

**Practical Examination will be held at the end of the year.**

**A) Distribution of marks :**

- **Continuous Internal Assessment for chemistry**:

1) Practical paper has 30*4=120 marks for internal examination.
2) Practical paper has 280 marks for external university practical examination.
   There will be three practicals, one from each Physical, Inorganic and Organic practical work.
3) The mark distribution of 280 marks for external university practical examination is as follows.

Q. 1 Physical Chemistry experiment : 90 marks
Q. 2 Inorganic Chemistry experiment : 100 marks
Q. 3 Organic Chemistry experiment : 90 marks

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Total marks: 280 marks

**Duration of practical examination is three days, six and half hours per day**
**All answer sheets should be collected at the end of examination.**

## Practical Marks Distribution

- **Physical Chemistry experiment: 90 marks**

a) **Instrumental : 40**
b) **Non-instrumental** : 30
c) **Journal : 10**
d) **Oral : 10**

- **Inorganic Chemistry experiment: 100 marks**

a) **Gravimetric analysis : 35**
b) **Volumetric analysis : 25**
c) **Preparation : 20**
d) **Journal : 10**
e) **Oral : 10**

- **Organic Chemistry experiment: 90 marks**

a) **Organic Mixture Separation and analysis: 35**

b) **Volumetric analysis : 25**

**OR**

b) **Preparation :25**
0c) **Derivative : 10**
d) **Journal :10**
e) **Oral : 10**

## Theory

**N. B.**

i.) Figures shown in bracket indicates the total number of contact hours required for the respective topics

ii) The question paper should cover the entire syllabus. Marks allotted should be in proportion to the number of contact hours allotted to respective topics.

iii) All topics should be dealt with S.I units.

iv) Use of scientific calculator is allowed.

v) Industrial tour is prescribed.

vi) Values required for spectral problems should be provided in the question paper.

## SEMESTER –V

## PAPER-IX : PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Phase Equilibria.** **[10]**

1.1 Introduction

1.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in the equation.

1.3 Phase diagram, true and metastable equilibria.

1.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism.

1.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisation of lead (ii) Formation of compound with congruent melting point ($FeCl_3$ - $H_2O$)

**2. Electromotive force.** **[23]**

**(Convention : Reduction potentials to be used)**

2.1 Introduction

2.2 Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms of activities.

2.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emf equation for,

i) Metal - metal ion electrode. ii ) Amalgam electrode.

iii) Metal - insoluble salt electrode. iv) Gas - electrode.

v) Oxidation - Reduction electrode.

2.4 i) Reversible and Irreversible cells.

ii) Chemical cells without transference.

iii) Concentration cells

a. Electrode concentration cell

I) Reversible to cation

II) Reversible to anion

b. Electrolyte concentration cells without transference

2.5 Equilibrium constant from cell emf, determination of the thermodynamic parameters such as $\Delta G$, $\Delta H$ and $\Delta S$.

2.6 Applications of emf measurements :

i) Determination of pH of solution using Hydrogen electrode.

ii) Solubility and solubility product of sparingly soluble salts (based on concentration cell).

2.7 Numerical problems.

**3. Photochemistry.** **[12]**

3.1 Introduction

3.2 Difference between thermal and photochemical processes.

3.3 Laws of photochemistry : Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark - Einstein law.

3.4 Quantum yield, Reasons for high quantum yield (e.g. $H_2$ - $Cl_2$) and low quantum yield. ( e.g. Decomposition of HI and HBr).

3.5 Photosensitized reactions - Dissociation of $H_2$, Photosynthesis.

3.6 Photodimerisation of anthracene.

3.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence and phosphorescence.

3.8 Chemiluminescence.

3.9 Numerical problems.

***Reference Books:***


1. Physical Chemistry by G. M. Barrow, International student Edition, Mc Graw Hill.
2. University General Chemistry by C.N.R. Rao, Macmillan.
3. Physical Chemistry by, R. A. Alberty, Wiley Eastern Ltd.
4. The Elements of Physical Chemistry by P. W. Atkins, Oxford.
5. Principles of Physical Chemistry by S. H. Maron, C. H. Prutton, 4th Edition.
6. Fundamentals of Photochemistry by K.K. Rohatgi-Mukerjee.
7. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
8. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Ltd.
9. Elements of Physical Chemistry by D. Lewis and S. Glassture (Macmillan).
10. Principles of Physical Chemistry by Maron and Lando (Amerind).
11. An Introduction to Electrochemistry by S. Glasstone.
12. Physical Chemistry by W. J. Moore.
13. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).


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## PAPER -X: INORGANIC CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Metal Ligand Bonding in Transition Metal Complexes : [13]**

A) **Crystal Field Theory (CFT).**

1.A.1) Introduction - What is CFT?

1.A.2) Basic concept of CFT.

1.A.3) Formation of complexes with Crystal field splitting of 'd' orbitals

i. Shapes of d orbitals and their electron density region

ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): $[CoF6]^{3-}$, $[Co(NH_3)_6]^{3+}$.

iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g. $[CoCl_4]^{2-}$

iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co(CN)_4]^{2-}$

1.A.4. Jahn - Tellar distortion.

1.A.5. Factors affecting the Crystal - field splitting.

1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only.

1.A.7. Applications and limitations of CFT.

**B) Molecular Orbital Theory (MOT).**

1.B.1. Introduction.

1.B.2. Basic concept

1.B.3. Symmetry classes of atomic orbitals

1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedral complex.

1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$ , $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$

1.B.6. Applications and limitations of MOT.

1.B.7. Comparison between CFT and MOT.

**2. Nuclear Chemistry: [12]**

2.1. Nuclear reaction and energetics of nuclear reactions.

2.2. Classification of nuclear reactions and Types of nuclear reactions:

i) Artificial transmutation.

ii) Artificial radioactivity.

iii) Projectile capture reaction.

iv) Projectile capture - particle emission reaction.

v) Nuclear fission.

vi) Nuclear fusion.

2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb.

2.4. Applications of radioisotopes as tracers.

i) Chemical investigation - Esterification.

ii) Structural determination - Phosphorus pentachloride.

iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood.

iv) Age determination - Dating by $^{14}C$.

**3. Bioinorganic Chemistry: [08]**

3.1. Essential and trace elements in biological process.

i) Essential elements a) Macro / major elements b) Micro/trace/minor elements

ii) Non-essential elements

3.2. Metalloporphyrins with special reference to haemoglobin and myoglobin.

i) Structure of Haemoglobin (Hb)

ii) Structure of Myoglobin (Mb)

iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs to tissues

iv) Function of Haemoglobin as Carry back $CO_2$ to lungs

v) Co-operativity

vi) Oxygen binding curve

vii) Difference between Haemoglobin (Hb) and Myoglobin (Mb)

3.3. Role of alkali and alkaline earth metal ions with special reference to $Na^+$ , $K^+$ and $Ca^{2+}$.

i) Role of $Na^+$ and $K^+$

ii) Role of $Ca^{2+}$ .

**4. Catalysis [06]**

4.1. Introduction

4.2. Classification of catalytic reactions : Homogeneous & Heterogeneous

4.3. Types of catalysis

4.4. Characteristics of catalytic reactions

4.5. Mechanism of catalysis :

i) Intermediate compound theory

ii) Adsorption theory.

4.6. Industrial Applications of Catalysis.

**5. Fertilizers [06]**

5.1. Nutrient Functions in plant growth :

Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency.

5.2. Definition and qualities of an ideal fertilizers:

5.3. Classification or types of fertilizers:

5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammonium phosphate.

5.5. Mixed fertilizers, Compound or complex fertilizers.

5.6. Pollution caused by fertilizers:

**(Reference Material : Industrial Chemistry, By – B K Sharma, Goel Publishing House 16th Edition: Topic No 26, Page No. 762 to 808)**

**Reference Books:**


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford,Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan (S Chand)
23. Selected Topics in inorganic chemistry by W U Malic, G. D. Tuli, R. D. Madan. (S. Chand)
24. Industial chemistry part I and II by A. K. De
25. Industrial chemistry by B. K. Sharma

# Paper – XI: Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1 Spectroscopic Methods.** **[20]**

**1.1. Infrared Spectroscopy :**

1.1.1 Introduction.
1.1.2 Principle of IR spectroscopy.
1.1.3 Double beam IR spectrophotometer- Schematic diagram.
1.1.4 Fundamental modes of vibrations.
1.1.5 Types of vibrations.
1.1.6 Hooke's law.
1.1.7 Factors affecting values of vibrational frequencies.
1.1.8 Conditions for absorption of radiation and selection rule.
1.1.9 Fundamental group regions of IR spectrum.
1.1.10 Functional group region, Finger print region, Aromatic region.
1.1.11 Characteristic absorption of various functional groups.
1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups, spectral problems based on IR.

**1.2 NMR Spectroscopy**.

1.2.1 Introduction.
1.2.2. Proton magnetic resonance ($^1$H) spectroscopy (PMR).
1.2.3 Principles of PMR spectroscopy.
1.2.4 Magnetic and non-magnetic nuclei.
1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance.
1.2.6 NMR - Instrument. Schematic diagram.
1.2.7. Shielding and deshielding effect.
1.2.8. Chemical shift, measurement of chemical shift by delta scale and tau scale.
1.2.9. TMS as reference. Advantages of TMS.
1.2.10. Peak area (integration).
1.2.11. Spin - spin splitting (n + 1 rule).
1.2.12. Definition of coupling constant (J value) of first order coupling.
1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone, benzaldehyde, propanoic acid and benzoic acid.
1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to be given).

**1.3 Mass spectroscopy.**

1.3.1 Introduction.
1.3.2 Theory of mass spectroscopy
1.3.3 Mass spectrometer - schematic diagram
1.3.4 Formation of ions by ionization
1.3.5 Types of ions with examples.
1.3.6. Applications of mass spectroscopy.
i) Determination of molecular weight.
ii) Determination of molecular formula.

**2. Stereochemistry.** **[07]**

2.1 Introduction.
2.2 Baeyer's strain theory.
2.3 Theory of strainless rings.
2.4 Conformation and stability of cyclohexane and monosubstituted cyclohexanes - methyl cyclohexane.
2.5 Locking of conformation in t-butyl cyclohexane.
2.6 Stereoselective and stereospecific reactions :
i) Stereochemistry of addition of halogens to alkenes : syn and anti addition. Example - Addition of bromine to 2-butene. (mechanism not expected)
ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol (Example of $SN^2$ reaction)

**3. Name reactions.** **[10]**

Mechanism and applications of following reactions :
3.1 Stobbe condensation.
3.2 Oppenauer oxidation.
3.3 Meerwein Ponndorf Verley reduction.
3.4 Reformatsky reaction.
3.5 Wagner - Meerwein Rearrangement.
3.6 Hofmann rearrangement reaction.
3.7 Wittig reaction.
3.8 Related problems.

**4. Organic synthesis via Enolates** **[08]**

4.1 Introduction - Reactive methylene group.
4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocyclic compound.
4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic acid, α- β- unsaturated acid, α-amino acid and heterocyclic compound.

***Reference Books :***


1) Organic Chemistry : D. J. Cram and G. S. Hammond, McGraw Hill book Company, New York.
2) Organic Chemistry : I. L. Finar, The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry : Peter Sykes, Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry : R. T. Morrison and R. N. Boyd, Prentice Hall of India Private Limited, New Delhi. 6th Edition.
5) Text book of organic Chemistry : L. N. Ferguson, N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III: S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Eastern, Limited, New Delhi.
7) A text book of organic Chemistry : K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry : Arun Bahl and B. S. Bahl , S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism : Raj K. Bansal , Wiley Easter Ltd., New Delhi.
10) Reaction Mechanism and Reagents in Organic Chemistry: G. R. Chatwal, Himalaya Publishing House, New Delhi.
11) Stereochemistry conformation and mechanism: P. S. Kalsi, New Age International Publishers, 4th Edition.
12) Organic Chemistry Volume I and II : I. L. Finar ELBS with Longman 6th Edition.
13) Organic Chemistry Volume I and II : William Kemp, ELBS with Mc. Million 3rd Edition.
14) Advanced Organic Chemistry: Jerry March, Wiley Eastern Ltd.
15) Spectroscopy of Organic compounds: P. S. Kalsi.

16) Modern Methods of Organic Synthesis, W Carruthers, Iaon Coldhalm, Cambridge University Press
17) Organic Chemistry : Fieser and Fieser.
18) Principles of Organic Chemistry : English and Cassidy.
19) Elementary Organic Absorption Spectroscopy : Y. R. Sharma.
20) Spectroscopy : V. M. Parikh.
21) Stereochemistry of Carbon Chemistry : Eliel.
22) Principles of Organic Chemistry : M. K. Jain.
23) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
24) Organic Chemistry : A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
25) Reactions, Rearrangements and reagents : S.N.Sanyl, Bharati Bhawan publishers and Distributors Patna.

## PAPER-XII : (DSE-1)
## ANALYTICAL AND INDUSTRIAL PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Colorimetry.** **[08]**

1.1 Introduction

1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law.

1.3 Classification of methods of color measurement or comparison, Photoelectric photometer method - single cell photo-electric colorimeter.

**2. Potentiometry** **[10]**

2.1 Introduction.

2.2 Detail study of calomel, quinhydrone and glass electrodes and their use in determination of pH.

2.3 Basic circuit diagram of direct reading potentiometer

2.4 Potentiometric titrations : Classical and analytical methods for locating end points,

i) Acid - Base titrations.

ii) Redox - titrations.

iii) Precipitation titrations.

2.5 Advantages of potentiometric titrations.

**3 Electroplating** **[08]**

3.1 Introduction.

3.2 Electrolysis, Faraday's laws, Cathode current efficiency.

3.3 Basic principles of electroplating, cleaning of articles.

3.4 Electroplating of Nickel and Chromium.

3.5 Anodising.

**4 Flame photometry** **[09]**

4.1 General principles.

4.2 Instrumentation : Block diagram,
Burners: Total consumption burner, premix or laminar-flow burner and Lundergraph burner,
Mirrors,
Slits,
Monochromators,
Filters
Detectors.

4.3 Applications in qualitative and quantitative analysis.

4.4 Limitations of flame photometry.

**5. Conductometry:** **[10]**

5.1 Basic circuit of D.C. Wheatstone bridge, Measurement of conductance by Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molar conductance.

5.2 Conductometric acid-base titrations

i. Strong acid against strong base

ii. Strong acid against weak base

iii. Weak acid against strong base.

iv. Weak acid against weak base.

5.3 Advantages of conductometric titrations

***Reference Books :***


1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rd Edition).
2. Instrumental methods of Chemical analysis by Willard, Merit and Dean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (Himalaya Publication).
4. Principles of electroplating and eletroforming by Blum and Hogaboom, Mac Graw - Hill Book Co. 3rd Edn.
5. Vogel's text book of Quantitative Inorganic Analysis by Basssett and Denny etc. ELBS and Longman 4th Edition.
6. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
7. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
8. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
9. Principles of Physical Chemistry by Maron and Lando (Amerind).
10. An Introduction to Electrochemistry by S. Glasstone.
11. Physical Chemistry by W. J. Moore.
12. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).


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# PAPER-XII : (DSE-2)
# METHODOLOGY AND MATERIALS OF INDUSTRIAL IMPORTANCE

**Total Credits: 3**
**Contact hrs: 45**

**1. Data Analysis (13 Lectures)**

1.1 The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments.
1.2 Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests.
1.3 Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals,
1.4 General polynomial fitting, linearizing transformations, exponential function fit, 'r' and its abuse.
1.5 Basic aspects of multiple linear regression analysis.

**2. Chemical Safety and Ethical Handling of Chemicals: (12 Lectures)**

2.1 Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation.
2.2 Safe storage and use of hazardous chemicals,
2.3 Procedure for working with substances that pose hazards, flammable or explosive hazards,
2.4 Procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals,
2.5 Procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system.
2.6 Incineration and transportation of hazardous chemicals.

**3. Nanomaterials: (10 Lectures)**

3.1 Overview of nanostructures and nanomaterials: classification.
3.2 Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control.
3.3 Carbon nanotubes and inorganic nanowires.
3.4 Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials,
3.5 Bionano composites.

**4. Composite materials: (10 Lectures)**

4.1 Introduction, limitations of conventional engineering materials, role of matrix in composites,
4.2 Classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites.
4.3 Environmental effects on composites.
4.4 Applications of composites.

**Reference Books**

1) Practical skills in chemistry, Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) 2nd Ed. Prentice-Hall, Harlow.
2) Data analysis for chemistry, Hibbert, D. B. & Gooding, J. J. (2006) Oxford University Press.
3) Errors of observation and their treatment, Topping, J. (1984). Fourth Ed., Chapman Hall, London.
4) Quantitative chemical analysis, Harris, D. C. 6th Ed., Freeman (2007) Chapters 3-5.
5) How to use Excel in analytical chemistry and in general scientific data Analysis, Levie, R. de, Cambridge Univ. Press (2001) 487 pages.
6) Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
7) Inorganic Solids: An introduction to concepts in solid-state structural Chemistry, Adam, D.M. John Wiley & Sons, 1974.
8) Introduction to Nanotechnology, Poole, C.P. & Owens, F.J. John Wiley & Sons, 2003.

## SEMESTER-VI

## PAPER- XIII: PHYSICAL CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

**1. Spectroscopy.** **[10]**

1.1 Introduction
1.2 Electromagnetic radiation.
1.3 Electromagnetic spectrum, Energy level diagram.
1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzmann distribution), determination of bond length; isotope effect. Interaction of radiation with rotating molecule.
1.5 Vibrational spectra of diatomic molecules : Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant, overtones. Interaction of radiation with vibrating molecules.
1.6 Numerical problems.

**2. Solutions.** **[09]**

2.1 Introduction
2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids.
2.3 Vapour pressure and boiling point diagrams of miscible liquids.
Type I : Systems with intermediate total vapour pressure.
(i.e. System in which B.P. increases regularly - Zeotropic)
Type II : Systems with a maximum in the total vapour pressure.
(i.e. System with a B.P. minimum - Azeotropic)
Type III :Systems with a minimum in the total vapour pressure.
(i.e. System with a B.P. Maximum - Azeotropic)
Distillation of miscible liquid pairs.
2.4 Solubility of partially miscible liquids.
(i) Maximum solution temperature type : Phenol - water system.
(ii) Minimum solution temperature type : Triethyl amine - water system.
(iii) Maximum and minimum solution temperature type : Nicotine - water system.

**3. Thermodynamics.** **[13]**

3.1 Introduction
3.2 Free energy : Gibbs function (G) and Helmholtz function (A), Criteria for thermodynamic equilibrium and spontaneity.
3.3 Relation between G and H : Gibbs Helmholtz equation.
3.4 Phase equilibria : Clapeyron - Clausius equation.
3.5 Thermodynamic derivation of law of mass action, van't Hoff isotherm and isochore.
3.6 Fugacity and activity concepts.
3.7 Numerical problems.

**4. Chemical Kinetics** **[13]**

4.1 Introduction, simultaneous reactions such as opposing reactions, side reactions, consecutive reactions and chain reactions. [Derivations of rate Equations for these reactions are not expected.]

4.2 Effect of temperature on the rate of reaction.
1. Temperature coefficient
2. Arrhenius equation
3. Energy of activation

4.3 Theories of reaction rate :
1. Collision theory and
2. Transition state theory

4.4 Third order reaction with equal concentration of all reactants, their characteristics and examples
4.5 Numerical problems.

***Reference Books :***


1. Principles of Physical Chemistry by Maron and Pruton 4th edition.
2. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
3. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
4. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
5. Principles of Physical Chemistry by Maron and Lando (Amerind).
6. Thermodynamics for chemists by S Glasstone.
7. Physical Chemistry by W. J. Moore.
8. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).
9. Basic Chemical Thermodynamics by V V Rao (McMillan)
10. An introduction to chemical thermodynamics by R. R. Mishra and R. P. Rastogi.
11. Fundamentals of molecular spectroscopy by C. N. Banwell and McCash- Tata McGraw Hill


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## PAPER-XIV: INORGANIC CHEMISTRY

**Total Credits: 3**
**Contact hrs: 45**

## 1) Study of F-block Elements [11]

1.1 Lanthanides :-

I) Introduction
II) Electronic configuration
III) Occurrence
IV) Separation of Lanthanides
  i) Bulk separation methods
  ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail)

1.2 Actinides :-

I) Introduction
II) Electronic configuration
III) General Methods of preparation –
  a. Neutron-capture followed by β-decay
  b. Accelerated projectile bombardment method
  c. Heavy-ion bombardment method

1.3 IUPAC Nomenclature of the Super Heavy Elements with atomic numbers (Z) greater than 100.

## 2) Metals and Semiconductors. [11]

2.1 Introduction.
2.2 Properties of metallic solids.
2.3 Theories of bonding in metal.
  a) Free electron theory.
  b) Molecular orbital theory (Band theory).
2.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory.
2.5 Semiconductors:
  a) Types of semiconductors - intrinsic and extrinsic semiconductors.
  b) Applications of semiconductors.
2.6 Superconductors :
  a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_{7-x}$
  b) Applications of superconductors.

## 3) Structural Chemistry. [11]

3.1 Structural study of following compounds.
  i) Diborane.
  ii) Borazine.
  iii) Xenon compounds → $XeF_2$, $XeF_6$, $XeO_4$ (w.r.t. VBT only.)
3.2 Structural study of Oxides of Sulphur and Phosphorous:
  i) Oxides of Sulphur : $SO_2$ and $SO_3$
  ii) Oxides of Phosphorous : $P_4O_6$ and $P_4O_{10}$

## 4) Corrosion and Passivity. [07]

**4.1 Corrosion :-**

I. Introduction
II. Types of corrosion
III. Electrochemical theory of corrosion
IV. Factors affecting the corrosion
  i) Position of metal in emf series.
  ii) Purity of metal.
  iii) Effect of moisture.
  iv) Effect of oxygen.
  v) Hydrogen over voltage.
V. Methods of protection of metals from corrosion.

**4.2 Passivity :-**

I. Definition.
II. Types of passivity.
III. Oxide film theory.
IV. Application of passivity.

## 5. Organometallic Chemistry. [05]

5.1 Introduction - Definition,
5.2 Nomenclature of organometallic compounds.
5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be and Al.
5.4 Mononuclear carbonyl and nature of bonding in simple metal carbonyls.

## *Reference Books :*


1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford, Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Organometallic Chemistry by P. L. Pauson.
23. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan
24. Selected Topics in inorganic chemistry by W U Malik, G. D. Tuli, R. D. Madan. (S. Chand)
25. Industrial chemistry part I and II by A. K. De
26. Industrial chemistry by B. K. Sharma

## Paper - XV : Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1 Heterocyclic compounds** **[09]**

1.1 Introduction and classification
1.2 Pyrrole
1.2.1 Methods of synthesis
i) From acetylene
ii) From furan
iii) From succinamide
1.2.2 Physical properties
1.2.3 Reactivity of pyrrole
i) Basic character
ii) Acidic character
iii) Electrophilic substitution with general mechanism
1.2.4 Chemical reactions
i) Reduction
ii) Oxidation
iii) Nitration
iv) Sulphonation
v) Halogenation
vi) Friedel Craft's reaction
vii) Coupling reaction

1.3 Pyridine
1.3.1 Methods of synthesis
i) From acetylene and hydrogen cyanide
ii) From piperidine
1.3.2 Physical properties
1.3.3 Chemical reactions
i) Basic character
ii) Electrophilic substitution reactions : Nitration, Sulphonation and Bromination
iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyl lithium.
1.4 Quinoline
1.4.1 Synthesis - Skraup's synthesis
1.4.2 Physical properties.
1.4.3 Reactions of quinoline
i) Electrophilic substitution reactions - Nitration and sulphonation.
ii) Nucleophilic substitution reactions – Reactions with sodamide, alkyl lithium and aryl lithium
iii) Reduction

**2. Carbohydrates** **[11]**

2.1 Introduction
2.2 Classification and nomenclature
2.3 Monosaccharide D-glucose - Open chain structure
2.4 Chain lengthening of Aldoses - Kiliani synthesis
2.5 Chain shortening of Aldoses - Weerman's reaction
2.6 Interconversion of glucose and fructose
2.7 Configuration of D-glucose from D-arabinose
2.8 Objections against open chain structure of D-glucose.
2.9 Mutarotation with mechanism.
2.10 Ring structure of D-glucose - Determination of size of ring by
i) Methylation method.
ii) Periodic acid oxidation method.
2.11 Disaccharides - Introduction, sucrose and lactose - sources, structural formulae and uses.
2.12 Polysaccharides – Introduction, Starch and Cellulose - sources, structural formulae and uses

**3. Vitamins and Hormones** **[07]**

3.1 General idea of vitamins, structure and synthesis of vitamin A
3.2 General idea of hormones, structure and synthesis of Adrenaline and Thyroxin

**4. Pharmaceuticals** **[07]**

4.1 Introduction
4.2 Qualities of ideal drug
4.3 Methods of classification of drugs - Classification based on the therapeutical action
4.4 Brief idea of pencillin-G ( constitution, synthesis not expected)
4.5 Synthesis and uses of the following drugs :

i) Antimalerials - Paludrin
ii) Antituberculars - Isoniazide and Ethambutol
iii) C. N. S. drugs - Phenobarbitone
iv) Antidiabetics - Tolbutamide
v) Anti-inflammatory drugs - Ibuprofen
vi) Antibiotics - Chloromycetin
vii)Anticancer drugs : Chlorambucil (Leukeran)

**5 Synthetic dyes.** **[07]**

5.1 Introduction, Qualities of good dye
5.2. Classification based on constitution and methods of applications
5.3 Witt's theory - Colour and constitution
5.4 Synthesis of Orange IV, Malechite green, phenolphthalein

**6 Agrochemicals.** **[04]**

6.1 General idea of agrochemicals including pyrethroides.
6.2 Synthesis and uses of the following agrochemicals :

i) Indole-3-acetic acid.
ii) Monocrotophos
iii) Methoxychlor
iv) Ethophan
v) Carbaryl
vi) Baygon

***Reference Books :***


1) Organic Chemistry - Cram D. J. and Hammond G.S. McGraw Hill book Company New York.
2) Organic Chemistry - Finar I. L. The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry - Peter Sykes Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry - R. T. Morrison and R. N. Boyd Prentice Hall of India private limited New Delhi. 6th Edition.
5) Text book of organic Chemistry - Ferguson L. N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III - S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Estern, Limited, New Delhi.
7) A text book of organic Chemistry - K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry - Arun Bahl and B. S. Bahl S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism - Raj K. Bansal Wiley Easter Ltd. New Delhi.
10) Reaction Mechanism and reagents in Organic Chemistry - G. R. Chatwal Himalaya Publishing House New Delhi.
11) Organic Chemistry Volume I and II - I. L. Finar ELBS with Longman 6th Edition.
12) Organic Chemistry Volume I and II - William Kemp ELBS with Macmillion 3rd Edition.
13) Advanced Organic Chemistry - Jerry March Wiley Eastern Ltd.

14) Organic Chemistry - Fieser and Fieser.
15) Principles of Organic Chemistry - English and Cassidy.
16) Chemicals for crop improvement and pest management - Green, Hartly and West.
17) Chemistry of pesticides - K. H. Buchel (T. W.).
18) Medical Chemistry - Burger.
19) Principles of Organic Chemistry - M. K. Jain.
20) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
21) Organic Chemistry - A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
22) Reactions, Rearrangements and reagents - S.N. Sanyl, Bharati Bhawan publishers and Distributors Patna.
23) Synthetic Organic Chemistry-Kamlesh Bansal.
24) Synthetic Organic Chemistry-Gurudeep Chatwal.
25) Chemistry of Insecticides – U.S. Sree Ramulu.
26) Medicinal Chemistry- Ashitosh Kar.

## Paper-XVI:( DSE-1)
## Analytical and Industrial Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

**1. Soaps and Detergents.** **[08]**

1.1 Soaps
i) Raw materials
ii) Types of soaps
iii) Manufacture of soap - Hot process
iv) Cleansing action of soaps
1.2 Detergents
i) Raw materials
ii) Types of detergents - Cationic, anionic, amphoteric, neutral detergents
iii) Preparation of teepol and deriphat
1.3 Comparison between soaps and detergents

**2. Synthetic Polymers.** **[08]**

2.1 Introduction
2.2 Classification :
i) According to origin, composition, method of preparation and general physical properties
ii) Classification based upon structure
2.3 Process of addition polymerisation - free radical polymerisation of alkenes and Dienes
2.4 Ionic polymerisation
2.5 Ziegler - Natta polymerisation
2.6 Methods of preparation and uses of :
i) Polystyrene ii) PVC iii) Phenol formaldehyde resin iv) Polyurethane
2.7 Natural rubber : General idea and vulcanisation
2.8 Synthetic rubbers : Synthesis and uses of :
i) Polychloroprene ii) Buna rubber - Buna N and Buna S

**3. Sugar and Alcohol Industry** **[09]**

3.1 Manufacture of raw cane sugar
3.2 Refining of raw sugar
3.3 White sugar
3.4 By-products of sugar industry
3.4.1 Manufacture of ethyl alcohol from molasses
3.4.2 Rectified spirit, Denatured spirit absolute alcohol and power alcohol
3.4.3 By-products of alcohol industry

**4. Synthetic Reagents** **[07]**

**4.1** Sodium borohydride: Use in reduction of aldehydes and ketones
**4.2** Lithium aluminium hydride: Use in reduction of aldehydes, ketones, acids, amides and esters
**4.3** Osmium tetroxide **:** Hydroxylation of alkenes
**4.4** 1,3-dithiane : Umpolung concept, reactions with alkyl halide and acyl halide
**4.5** Selenium dioxide : Oxidation of carbonyl compounds and allylic oxidation

**5. Green Chemistry.** **[04]**

5.1 Introduction - Twelve principles of green chemistry
5.2 PTC: Introduction, Role in organic reactions catalysis
5.3 Biocatalytic reactions - Hydroxylation and oxidation using enzymes
5.4 Introduction to microwave assisted reactions
5.5 Ionic liquids – Introduction and examples of ionic liquids

**6 Chromatography.** **[09]**

6.1 Introduction
6.2 General principles
6.3 Classification
6.4 Study of following chromatographic techniques with reference to principle, methodology and applications
i) Paper chromatography
ii) Column chromatography
iii) Thin layer chromatography
iv) Gas chromatography

***Reference) Books :***

1. Basic Concepts of Analytical Chemistry - S. M. Khopkar, Wiley Eastern Ltd., Bombay.
2. Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.
3. Text Book of Quantitative Organic Analysis - A. I. Vogel, Pearson Edn. Delhi.
4. Quantitative Organic Chemistry - A. I. Vogel, Pearson Edn. Delhi.
5. Hand Book of Organic Analysis - H. T. Clarke, Arnold Heinemann Pub. Delhi.
6. Advanced Organic Chemistry - B. S. Bahl and Arun Bahl, S. Chand Comp. Delhi.
7. Riegel's Handbook of Industrial Chemistry - J. A. Kent, Van. Nostrard, Londan.
8. Chemical Process Industries - Shreve and Brinic - Ostin, Magraw Hill, New York.
9. Analytical Chemistry- Walton.
10. Biotechnology and Applied Microbiology - Alani and Moo-Young.
11. Immobilize Biocatalysis - Joy Wleser.
12. Introduction to Polymer Chemistry - Raymond B. Seymour.
13. Polymer Science - V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar Willey Eastern Limited.
14. Advances in Green Chemistry : Chemical synthesis using MW-irradiation by R. S. Varma.
15. Green Chemistry : Environment Friendly alternatives - Rashmi Sanghi and M. M. Srivastava (Eds) (c) 2003 Narosa Publishing House, New Delhi, India.
16. Reactions, rearrangements and reagents : S. N. Sanyal
17. Organic reaction mechanism : V. K. Ahluwalia and K.R.K Parashar
18. Environment friendly synthesis using ionic liquids: Jairton Dupont, Toshiyuki Itoh and Sanjay V. Malhotra (CRC Press)

## Paper-XVI:( DSE-2)
## Applied Organic Chemistry

**Total Credits: 3**
**Contact hrs: 45**

### 1. Theory of binary mixture analysis 05

1.1 Types of organic compounds, nature and types of binary mixtures.
1.2 Reactions of acid, base, phenol and neutrals with sodium bicarbonate, sodium hydroxide and hydrochloric acid
1.3 Principle of binary mixture separation.
1.4 Determination of type of the mixture
1.5 Separation of mixture- using aqueous medium and ether.

### 2. Green Chemistry 04

2.1 Introduction
2.2 Twelve principles of green chemistry
2.3 Zeolites as green catalysts
2.4 Ultrasound assisted reactions
2.5 Reactions in ionic liquids
2.6 Solvent free reactions

### 3. Chemistry of cosmetics 12

3.1 A general study including preparation and uses of- Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, cold creams, vanishing creams and shaving creams

### 4. Chemistry of perfumes 12

4.1 A general study including preparation and uses of- antiperspirants, and artificial flavours
4.2 Essential oils and their importance in cosmetic industry with reference to Eugenol, geraniol, sandalwood oil, eucalyptus oil, rose oil, 2-phenyl ethyl alcohol, jasmone, civetone and muscone

### 5. Fermentation 05

5.1 Aerobic and anaerobic fermentation
5.2 Production of antibiotics- streptomycin
5.3 Production of vitamins-Vit. B12

### 6. Textile Chemistry 07

6.1 Introduction, classification of fibers
6.2 Sizing: object of sizing, sizing ingredients and their functions
6.3 General idea of processes : singeing, desizing, scouring
6.4 Bleaching: Brief study of the outline of the process of bleaching cotton and synthetic material.
6.5 Dyeing : Study of dyeing of cellulosic material and synthetic fibers with dyes like direct, vat, reactive and disperse dyes.

**Reference Books**


1. Industrial chemistry : B. K. Sharma(Goel Publishing House, Meerut)
2. Engineering Chemistry: P. C. Jain and M. Jain(Dhanpatrai and sons, Delhi)
3. Practical Organic Chemistry: A. I. Vogel
4. Advances in green chemistry-Chemical synthesis using Microwave irradiation: R. S. Verma
5. A book of textile chemistry: A. J. Hall
6. Bleaching and Dyeing : Dr. V. Shenai
7. Sizing : D. B. Ajgaonkar
8. Chemical process industries : Shreve and Brinik (Ostin McGrawHill Publication, New York)
9. Medicinal and Pharmaceutical Chemistry: Hakishan, V. K. Kapoor (Vallabh Prakashan Pimpura New Delhi)
10. Industrial Chemistry, Vol. I:E. Stocchi (Ellis Horwood Ltd, UK)

# PRACTICALS

N. B. i. Use of Electronic balance with 0.001g accuracy is mandatory.
ii. Use of Scientific calculator is allowed.

## Physical Chemistry

**I) Non instrumental Experiments( Any Five) :**

1. To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by the distribution method.
2. To determine the partition coefficient of $CH_3COOH$ between $H_2O$ and $CCl_4$.
3. Critical Solution Temperature.
To determine the CST for phenol – water system.
4. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl.
5. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N $H_2SO_4$.
6. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Equal concentrations).
7. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Unequal concentrations).
8. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
9. To study the effect of addition of electrolyte (KCl) on the reaction between $K_2S_2O_8$ and KI (Equal concentrations).

**II. Instrumental experiments**

**A. Potentiometry (Any Three).**

1. Titration of strong acid with strong alkali.
2. Preparation of buffer solution and determination of their pH (Any five buffer solutions), - Theoretical calculation of pH values by using Henderson's equation.
3. Determination of standard electrode potential of $Zn/Zn^{++}$ , $Cu/Cu^{++}$ , $Ag/Ag^{+}$ (Any two).
4. Determination of solubility and solubility product of AgCl.
5. Titration of ferrous ammonium sulphate using $K_2Cr_2O_7$ solution and to calculate redox potential of $Fe^{++}$ , $Fe^{+++}$ system

**B. Conductometry ( any three ).**

1. Titration of weak acid with strong alkali.
2. Titration of a mixture of weak acid and strong acid with strong alkali.
3. To study the effect of substituent on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid (cell constant to be given).
4. To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometric method.

**C. Refractometry.**

1. To determine the percentage composition of unknown mixture by (i) graphical method and (ii) by composition law (Densities of pure liquids A & B be given).
2. To determine the molar refractivity of methyl acetate, ethyl acetate, n-hexane and carbon tetrachloride and calculate the refraction equivalents of C, H and Cl atoms.

**D. Colorimetry (Any Two).**

1. To verify Lambert - Beer's law using $CuSO_4$ solution.
2. To estimate $Fe^{+++}$ ions by thiocynate method.
3. To estimate $Fe^{+++}$ ions using salicylic acid by colorimetric titration.

**E. pH - metry (Any One).**

1. To determine the dissociation constant of monobasic acid (Acetic acid).
2. To determine the dissociation constant of dibasic acid (Malonic acid).

**Reference Books :**


1. Findlay's Practical Physical Chemistry (Longman)
2. Advanced Practical Physical Chemistry by J. B. Yadav, Goel publishing house.
3. Practical Physical Chemistry by B. D. Khosla, V. C. Garg (R. Chand and Co.)
4. Systematic experimental Physical Chemistry by Rajbhoj, Chandekar (Anjali Publicaiton)
5. Practical Physical Chemistry : Nandkumari, Kothari and Lavande.
6. Practical Physical Chemistry by Gurtu (S. Chand).

## Inorganic Chemistry

**I. Gravimetric Estimations (G).**

N. B. : Any two experiments from G1 to G3 and any two experiments from G4 to G7

G1. Gravimetric estimation of iron as ferric oxide from the given solution containing ferrous ammonium sulphate, copper sulphate and free sulphuric acid.

G2. Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, ferrous ammonium sulphate and free sulphuric acid.

G3. Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride, ferric chloride and free hydrochloric acid.

G4. Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate, copper sulphate and free sulphuric acid.

G5. Gravimetric estimation of barium as barium chromate from the given solution containing barium chloride, ferric chloride and free hydrochloride acid.

G6. Gravimetric estimation of Aluminium as Aluminium oxinate i.e.
tris (8-hydroxyquinolinato) aluminate (III) from a given solution containing potash alum, copper sulphate and free sulphuric acid.

G7. Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) from the given solution containing nickel sulphate, ferrous ammonium sulphate and free sulphuric acid.

[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm and asked to dilute to 100 cm (or the stock solution should be given in the range of 20 to 30 cm and asked to dilute to 250 cm ). Use 50 cm of this diluted solution for estimation.]

**II. Inorganic Preparations (P) : (any five).**

N. B. – 1. Calculations of % yield is expected.

2. After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in terms of:

a) Name of central metal ion
b) Oxidation number of metal ion
c) Nature of ligand
d) Nature of bonding
e) Type of hybridization
f) Inner orbital or outer orbital complex
g) Geometry of the complex with structure
h) Magnetic property of the compound
i) Color of the compound
j) Nature :Crystalline /Amorphous

P1. Preparation of potassium trioxalatoferrate (III)

P2. Preparation of potassium trioxalatoaluminate (III)

P3. Preparation of tris(ethylenediamine)nickel (II) thiosulphate

P4. Preparation of sodium hexanitrocobaltate (III)

P5. Preparation of ammonium diamminetetrathiocynatochromate(III) (Reineck's salt)

P6. Preparation of cholropentaamminecobalt (III) chloride

P7. Preparation of hexamminenickel (II) chloride

P8. Preparation of tris(thiourea)cuprous(I) sulphate

**III) Titrimetric Estimations :**

**A) Percentage Purity** (any three)

V1. Determination of percentage purity of ferrous ammonium sulpahte.

V2. Determination of percentage purity of tetramminecopper (II) sulphate.

V3. Determination of percentage purity of potassium trioxalatoaluminate(III).

V4. Determination of percentage purity of potassium trioxalatoferrate (III).

**B) Analysis of Commercial Sample** ( any three).

V5. Determination of percentage of magnesium in the given sample of talcum powder.

V6. Determination of amount of aluminium in the given solution of potash alum.

V7. Determination of titrable acidity in the given sample of milk or lassi.

V8. Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.

V9. Determination of percentage purity of boric acid using supplied sodium hydroxide (Standard succinic or oxalic acid solution to be prepared for standardization of the given sodium hydroxide solution.)

**C) Ion exchange method**

V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).

V11. Determination of amount of magnesium and zinc in the given solution containing ($Mg^{++}$ and $Zn^{++}$) using anion exchange resin and standard solution of EDTA.

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***Reference Books:***

1. A text book of quantitative Inorganic Analysis - A. I. Vogel.
2. Text book of Quantitative Inorganic Analysis - Kolthoff and Sandell.
3. Experimental Inorganic Chemistry - Palmer W. G.
4. Advanced Practical Inorganic Chemistry - Adams and Raynor.
5. Handbook of Preparation Inorganic Chemistry. Vol. 1 and 11 - Brauer.
6. Manual in Dairy Chemistry - I.C.A.R. Sub-Committee on Dairy Education.
7. Chemical methods for environmental analysis - R. Ramesh and M. Anbu.

# Organic Chemistry

**I) Qualitative analysis**

Separation of binary mixture and Identification of its components. 5g of mixture is to be given for separation. At least **08 mixtures** are to be separated.

Nature 1) Solid - Solid : 4 mixtures

2) Solid - Liquid : 2 mixtures

3) Liquid - Liquid : 2 mixtures

1) Solid - Solid Mixtures :

One mixture from each of the following types should be given :

i) Acid + Phenol ii) Acid + Base

iii) Acid + Neutral iv) Phenol + Base

v) Phenol + Neutral vi) Base + Neutral

2) Solid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Acid + Neutral should be given.

3) Liquid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Base + Neutral should be given.

Following compounds should be used for preparation of mixtures:

Acids : Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, Aspirin, Oxalic acid.

Phenols: α-naphthol, β-naphthol

Bases : o -nitroaniline, m-nitroaniline, p-nitroaniline, aniline, o-toluidine and N, N-dimethyl aniline.

Neutrals : Naphthalene, acetanilide, m-dinitrobenzene, chloroform, carbon tetrachloride, acetone, nitrobenzene, ethyl acetate, ethyl benzoate, acetophenone, bromobenzene, urea and thiourea.

**II) Quantitative analysis : (Any four)**

**Organic estimations** :

1) Estimation of sucrose

2) Estimation of nitro group

3) Saponification value of oil.

4) Estimation of formaldehyde from given formalin solution.

5) Estimation of acid and ester present in the given mixture of acid and ester.

6) Estimation of acid and amide from the mixture of acid and amide.

**III) Organic Preparations** : (any four)

N.B.: a) Calculation of percentage practical yield.

b) Recrystallisation of crude product and its melting point.

c) The purity of the product may be confirmed by TLC.

1) Preparation of m-nitroaniline from m-dinitrobenzene.

2) Preparation of aspirin from salicylic acid.

3) Preparation of nerolin from β-naphthol.

4) Preparation of p-iodonitrobenzene from p-nitroaniline.

5) Preparation of benzene azo - β - naphthol.

6) Preparation of benzoic acid from cinnamic acid.

**IV Preparation of Derivatives :**

N.B.:During practical course, name of the organic compound should not to be given.

1) Bromo derivative of aniline and cinnamic acid.

2) Nitro derivative of salicylic acid and nitrobenzene.

3) Benzoyl derivative of β-naphthol and aniline.

4) Picrate derivative of anthracene and β-naphthol.

5) Oxalate and nitro derivatives of urea.

6) Anhydride derivative of phthalic acid.

7) Oxime derivatives of Ketones : Acetone and acetophenone.

8) 2 : 4 DNP of acetophenone.

***Reference Books** :*

1. Practical Organic Chemistry by A. I. Vogel.

2. Hand book of Organic qualitative analysis by H. T. Clarke.

3. A laboratory Hand Book of Organic qualitative analysis and separation by V. S. Kulkarni. Dastane Ramchandra & Co.

4. Practical Organic Chemistry by F. G. Mann and B. C. Saunders. Low - priced Text Book. ELBS. Longman.

5. Experiments in General Chemistry by C. N. R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.

6. Advanced Practical Organic Chemistry by N. K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V. K. Ahluwalia, Sunita Dhingra. University Press. Distributor - Orient Longman Ltd.
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V.K. Ahluwalia, Renu Agarwal. University Press. Distributor-Orient Longmann Ltd.
9. Practical Chemistry - Physical - Inorganic - Organic and Viva - voce by Balwant Rai Satija. Allied Publishers Private Limited.30
10. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House, Mumbai.
11. College Practical Chemistry by Patel, Jakali, Mohandas, Israney Turakhia. Himalaya Publishing House, Mumbai.
12. Practice of thin layer chromatography by Joseph C. Touchstone, Murrell F. Dobbins. A Wiley - Interscience Publication John-Wiley & Sons.

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# Solapur University, Solapur


## B.Sc.III (Computer Science)

## Syllabus (Semester – V and VI)

## (Choice Based Credit System)

## With Effect from June 2018

## Semester-V

| Paper Code | Paper Name | Theory/ Practical | UA | CA | Total |
|---|---|---|---|---|---|
| IX | Visual Programming using C# | Theory | 70 | 30 | 100 |
| X | Core Java | Theory | 70 | 30 | 100 |
| XI | Operating System | Theory | 70 | 30 | 100 |
| **Elective** | | | | | |
| XII | Python | Theory | 70 | 30 | 100 |
| XII | Software Testing | Theory | 70 | 30 | 100 |

## Semester-VI

| Paper Code | Paper Name | Theory/ Practical | UA | CA | Total |
|---|---|---|---|---|---|
| XIII | Web Technology | Theory | 70 | 30 | 100 |
| XIV | Advanced Java | Theory | 70 | 30 | 100 |
| XV | Data communication and networking | Theory | 70 | 30 | 100 |
| **Elective** | | | | | |
| XVI | AngularJS | Theory | 70 | 30 | 100 |
| XVI | Linux Operating System | Theory | 70 | 30 | 100 |
| Practical IV | Based on paper IX, XIII | Practical | 70 | 30 | 100 |
| Practical V | Based on paper X, XIV | Practical | 70 | 30 | 100 |
| Practical VI | Project Based on IX, X,XII,XIII,XIV,XVI | Practical | 70 | 30 | 100 |
| Practical VII | Based on paper XII, XVI | Practical | 70 | 30 | 100 |

**Equivalence**

| Old Paper | New Paper |
|---|---|
| **Sem-V** | |
| Visual Programming | Visual Programming using C# |
| Core Java | Core Java |
| Operating System-I | Operating System |
| Data communication and networking-I | Data communication and networking |
| **Sem-VI** | |
| Web technology | Web Technology |
| Advanced Java | Advanced Java |
| Operating System-II | Linux |

| | |
|---|---|
| Data communication and networking-II | Software Testing |

# Semester – V

## Visual Programming Using C#

**Unit 1: .NET Architecture** **(6)**

Block diagram of .net framework, The Common Language Runtime, Advantages of Managed Code, A Closer Look at Intermediate Language & Assemblies-Support for Object Orientation and Interfaces, Distinct Value and Reference Types, Strong Data Typing, Garbage Collection

**Unit 2: C# Basics** **(6)**

Compiling and Running the Program, Variables, Data Types, Flow Control, Enumerations, Namespaces-The using Statement, Namespace Aliases, The Main() Method-Multiple Main() Methods, defining & using functions & its scope, Passing Arguments to Main(), Parameter passing technique.

**Unit 3: Objects and Types** **(4)**

Classes and Structs, Class Members- Data Members, Function Members read-only Fields, properties and indexer, The Object Class-System, Object Methods, The ToString() Method

**Unit 4: Inheritance and Polymorphism** **(8)**

Introduction-Types of Inheritance, Implementation Inheritance- Abstract Classes and Functions, Sealed Classes and Functions, Constructors and its types, Destructor, Interfaces-Defining and Implementing Interfaces, Derived Interfaces, Polymorphism - Method overloading, Operator overloading.

**Unit 5: Exception Handling** **(4)**

Try, catch, and throw, finally, Nested try, Custom exception

**Unit 6: Threading** **(4)**

Introduction- Applications with Multiple Threads, Thread Priorities, Synchronization, Life Cycle.

**Unit 7:File I/O and Streams** **(4)**

Stream Classes, Console I/O, File Stream and Byte-Oriented File I/O, Character based File I/O.

**Unit 8: Collection Classes** **[4]**

• Generic collection • Non generic collection

**Reference books:**

1. Professional C# - Wrox Publication by Simon Robinson, Christain Nagel, Karli Watson, Jay Glynn, Morgan Skinner, Bill Evjen.

2. Inside C# - Microsoft Press by Tom Archer, Andrew Whitechapel.

3. Programming Microsoft Visual C# 2005 - The Language (Microsoft Press) by Donis Marshall

# Core Java

**Unit 1: Introduction to Java Programming (4)**

Overview of Java, Features of Java as programming language /Platform, JDK Environment and Tools

**Unit 2: Java Programming Fundaments (4)**

Data types, Variables, Operators, Keywords, Naming Conventions, Structure of Java Program, Flow Control- Decision, Iterations, Arrays, Class – Members access control, Objects, Constructors, Use of 'this' keyword, Static, non-static data members and methods., public, private & protected data members

**Unit 3: Inheritance & Polymorphism (10)**

Access/Scope specifiers protected, Super, extends, single, multiple inheritance, Method overriding, Abstract classes & ADT, 'final' keyword, Extending interfaces

**Unit 4: Exception Handling and Java I/O (4)**

Exceptions and Types, try..catch, finally block, throw & throws statement, user-defined exceptions, Java I/O package, byte & character stream, reader & writer, file reader & writer

**Unit 5: Threading (4)**

Java thread lifecycle, Thread class & run able interface Thread priorities & synchronization, Usage of wait & notify

**Unit 6. Collection framework : (4)**

Collection overview, Collection interfaces, Collection classes Vector, Array list, Hash map, Hash table, Tree map, Tree set, Hash set, Properties, Stack

**Unit7: AWT, Applet, Swing and event handling: (10)**

Layout Managers :Border, Flow, Grid, Event Model, Listeners / Adapters, Anonymous classes, Introduction to Applet, Applet life cycle,types of applet,applet html tags, Introduction to AWT, Introduction to swing, difference between AWT and swing, hierarchy of Swing classes,
Swing controls: - JButton, JTextfield, JLabel, JCheckBox, JRadionButton, JFame, Jtable, JList, JoptionPane, JMenuitem and JMenu ,etc

**Reference Books:**


1. Java 2 for professional developers by Michael Morgen
2. Core Java Vol 1 and vol 2 by Cay. S. Horstmann, Gray Cornell.
3. Java by Nutshell
4. Java The complete Reference by Herbert Schildt
5. Thinking in java by Brucel

# Operating System

**Unit 1: Introduction Operating System:-** **(10)**

Definition Operating systems, Types of Operating Systems-Batch, Multiprogramming, Time-Sharing, Real-Time, Distributed, Parallel., OS Service, System components, System Calls, OS structure: Layered, Monolithic, Microkernel Operating Systems – Concept of Virtual Machine

**Unit 2: Process Management:-** **(15)**

Concept of Process, Process states, Process Control Block, Context switching, Operations on Process, Co-operating Process, Threads – Types of threads, Benefits of threads.

Concept of Process Scheduling- Types of Schedulers ,Scheduling criteria , Scheduling algorithms : Preemptive and Non-pre emptive , FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling, Multilevel- feedback Queue Scheduling .

**Process Synchronization and Deadlocks:-** The Producer Consumer Problem, Race Conditions, Critical Section Problem, Semaphores, Classical Problems of Synchronization: Reader-Writer Problem, Dinning Philosopher Problem, Critical Regions.

Definition, System Model, Dead Lock Characterization, Resource Allocation Graph, Methods of Handling Dead Locks- Deadlock Prevention, Deadlock Avoidance -banker's algorithm, resource-request algorithm, Deadlock detection and Recovery.

**Unit 3: Storage Management** **(15)**

**Memory Management** :- Basic Hardware Address Binding, Logical and Physical address Space, Dynamic Loading, Overlays, Swapping,

**Memory allocation :** Contiguous Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction, Paging, Segmentation. Basics of Virtual Memory, demand paging, Page fault, Page Replacement policies: Optimal (OPT), First in First Out (FIFO), Least Recently used (LRU), Thrashing.

**Storage Management:-** File Management: File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping).

**Disk Management:** disk structure, disk scheduling (FCFS, SSTF, SCAN, C-SCAN), disk reliability, disk formatting, boot block, bad blocks.

**Reference Books:**

1. System programming and O.S. By D.M. Dhamdhere.
2. Modern O.S. By Andrews Tanenbaum.
3. Operating System Concepts By Siberchatz and Galvin.
4. Operating System(Unix) By Bach

# Elective

## Python

**1: Introduction to Python:** **(4)**

Features/Characteristics of Python, Installation and Working with Python, Structure of a Python Program, Writing simple python program, Executing python program using command line window and IDLE graphics window, Python Virtual Machine, Identifiers and Keywords, Operators (Arithmetic operators, Relational operators, Logical or Boolean operators, Assignment Operators, Bit wise operators, Membership operators, Identity operators), Operator Precedence and Associativity

**2: Python Data Types:** **(4)**

Python Variables, Data types in python, Built-in Datatypes, Bool datatype , Sequences in python, Sets, Literals in python, User Defined Datatypes, Constants in python, Type conversion, Input and Output Statements, Command line arguments

**3: Control Statements:** **(4)**

Conditional Statements: if, if-else, nested if –else, Looping: for, while, nested loops, Loop manipulation using pass, continue, break, assert and else suite

**4: Strings, Collection Lists, Tuples and Dictionaries:** **(8)**

Strings: Introduction to String, String Manipulation., Collection List: Introduction to List, Manipulating list., Tuples: Introduction to Tuples, Manipulating Tuples., Dictionaries: Concept of Dictionary, Techniques to create, update & delete dictionary items.

**5: Functions, Modules** **(6)**

Difference between a Function and a Method, Functions:- Defining a function, Calling a function, Advantages of functions, Types of functions, Function parameters:-Formal parameters, Actual parameters, Anonymous functions, Global and Local variables, Modules:- Importing module, Creating & exploring modules, Math module, Random module, Time module

**6: Object Oriented Programming** **(6)**

Features, Concept of Class & Objects, Constructor, Types of Variables, Namespaces, Types of Methods, Inner Classes, Constructors in Inheritance, Overriding Super Class Constructors and Methods, Types of Inheritance, Abstract Classes and Interfaces, The Super() Method, Operator Overloading, Method Overloading, Method Overriding

**7: Regular Expressions** **(3)**

Introduction to Regular Expression, Advantages & Operations, Sequence characters in Regular Expression, Powerful pattern matching and searching, Password, email, url validation using regular expression, Pattern finding programs using regular expression

**8: Exception Handling** **(2)**

Errors in a Program, Exceptions, Exception handling, Types of Exceptions, User-defined Exceptions

**9: Python File Operation** **(3)**

Types of File, Opening and Closing a File, Reading and writing to files, Manipulating directories

**Reference Books**


1. Python Cookbook: Recipes for Mastering Python 3 by Brian Kenneth Jones and David M. Beazley-O'Reilly Media
2. Beginning Python by Magnus Lie Hetland-Apress

3. Python Programming for the Absolute Beginner by Michael Dawson-Cengage Learning
4. Python for Everybody: Exploring Data in Python 3 by Charles Severance-CreateSpace Independent Publishing Platform
5. Introducing Python: Modern Computing in Simple Packages by Bill Lubanovic-O'Reilly Media
6. Python Programming for Beginners: An Introduction to the Python Computer by Jason Cannon-CreateSpace Independent Publishing Platform
7. Python for Beginners by Harsh Bhasin

# Elective

## Software Testing

**Unit 1:-Introduction To Software Testing: (6)**

What is Software Testing?, Use or need of software testing. ,Software Development Life Cycle (SDLC) :- Water Fall Model, Spiral Model, V- Model, Prototype Model, Hybrid Model

**Unit- 2 White Box Testing: (9)**

Introduction to White box testing, Advantages and Disadvantages of White box testing, Loop Testing, Path Testing , Condition testing , Memory Testing , Performance Testing

**Unit- 3 Black Box Testing: (9)**

Introduction to black box testing , Advantages and Disadvantages of black box testing , Functional Testing- Integration Testing (Incremental Integration Testing ) ,Top Down Incremental Integration Testing , Bottom Up Incremental Integration Testing , Non Incremental Integration Testing , System Testing , Acceptance Testing , Smoke Testing , Exploratory Testing , Adhoc Testing , Performance Testing – Load Testing, Stress Testing, Volume Testing, Soak Testing, Regression Testing-Unit Regression Testing/Retest, Regional Regression Testing, Full Regression Testing

**Unit- 4 Test cases and its design Techniques: (8)**

Introduction to Test Case , Characteristics Of Good Test Case , Test Case Template, How To Write A Test Case, How To Ensure The Test Coverage Is Good , How To Identify whether It Is a Good Test Case Or Not, Review Process/Peer Review , Preparing Review Report, Examples On Writing Test Cases, Test Cases Design Techniques-Error Guessing, Equivalence Partitioning, Boundary Value Analysis

**Unit- 5 Software Test Life cycle and Defect Life Cycle: (8)**

Software Test Life Cycle-Writing Test Plan, Preparing Traceability Matrix, Writing Test Execution Report, Summary Report, Retrospect Meeting /Triage Meetings, Defect Life Cycle-Concept of Defect life cycle, Difference between Bug, Defect, Failure, Error

**Books Recommended:**

1) The art of Software Testing– Glenford J. Myers
2) Lessons learned in Software Testing – CemKaner, James Bach, Bret Pettichord
3) A Practitioner’s Guide to Software Test Design- Lee Copeland
4) Software Testing Techniques, 2nd edition- Boris Beizer
5) How to Break Software: A Practical Guide to Testing- James Whittaker

# Semester – VI

## Web Technology

**Unit 1: Introduction to ASP.Net** **(2)**

Introduction & diff. between ASP & ASP.Net 1.1 & 2.0 Application, Web Architecture Model, Introduction to Visual Studio for Web Application

**Unit 2: Application and Page Frameworks** **(5)**

Application Location Options, Built-In Web Server, IIS,FTP, Web Site Requiring FrontPage, Extensions, The ASP.NET Page Life Cycle, The ASP.NET Page Structure Options, Inline Coding, New Code-Behind Pages, ASP.NET 2.0 Page Directives, @Page, @Master, @Control, @Import, @Implements, @Register, @Assembly, @PreviousPageType, @MasterType, @OutputCache, @Reference. ASP.NET Page Events, Dealing with PostBacks, Cross-Page Posting, ASP.NET Application Folders, \App_Code Folder, \App_Data Folder, \App_Themes Folder, \App_GlobalResources Folder, \App_LocalResources, \App_WebReferences, \App_Browsers, Compilation, Global.asax

**Unit 3: ASP.NET Server Controls and Validation Controls** **(5)**

ASP.Net Server Controls, Understanding Validation, Client-Side versus Server-Side, Validation, ASP.NET Validation Server Controls, Validation Causes, The Required Field Validator Server Control, The CompareValidator Server Control, The RangeValidator Server Control, The RegularExpressionValidator Server Control, The CustomValidator Server Control, The ValidationSummary Server Control, Turning Off Client-Side Validation, Using Images and Sounds for Error Notifications, Working with Validation Groups

**Unit4: Working with Master Pages** **(6)**

Introduction of Master Pages- The Basics of Master Pages, Coding a Master Page, Coding a Content Page, Mixing Page Types and Languages, Specifying Which Master Page to Use, Working with the Page Title, Working with Controls and Properties from the Master Page, Specifying Default Content in the Master Page, Programmatically Assigning the Master Page, Nesting Master Pages, Master Page Events, Themes and Skins

**Unit 5: ASP.Net State Management** **(4)**

Application State, Session State, Client & server storing, View state, Cache, Hidden Variable, Session object, Profiles, Overview of HTTP Handler & Modules

**Unit 6:Site Navigation** **(4)**

Site Navigation technique, SiteMap file, SiteMapPath, TreeView and MenuView control, Using XML file

**Unit 7: ASP.NET web security** **(4)**

Authentication & Authorization, Windows & forms, User.identity, User.IsInRoles, Using Data Adapter, Debugging & error Handling, ASP.Net tracing, Page Level, Application Level, Debugging, Start Debugging session, Client side debugging, Exception Handling, On page, HTTP status code,

**Unit 8: Data Access with ADO.NET** **(8)**

ADO.NET Overview, Using Database Connections, Executing Commands, Calling Stored Procedures, Fast Data Access: The Data Reader, Data Adapter

**Unit 9:Introduction to AJAX** **(2)**

Introduction to AJAX and Need of AJAX, Server side and client side architecture ScriptManager, UpdatePanel, Timer control.

**Reference Books:**

1. Professional ASP.NET 2.0 – Wrox Publication by Bill Evjen, Scott Hanselman, Farhan Muhammed, Sirnivasa Sivakumar, Devin Rader.

2. Microsoft ASP.NET 2.0 Step by Step - Microsoft Press by George Shepherd.

# Advanced Java

**Unit -1:-JDBC** **(8)**

Introducing JDBC: Describing Components of JDBC, Features of JDBC, JDBC Architecture: Types of Divers:Advantages and disadvantages of Drives, Use of Drivers, JDBC Statement and Methods:- Statement, PreparedStatement, CallableStatement, execute(), executeQuery(), executeUpdate(), Working with Resultset interface,Working with Resultset and MetaData.

**Unit -2:-Servlet** **(12)**

Introducing CGI, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Introducing Servlet API, Javax.servlet package, Javax.servlet.http package, Introducing Servlet, Advantages of Servlet over CGI, Features of Servlet, Servlet life Cycle, Init(), Service(), Destroy(), Working with GenericServlet and HttpServlet, RequestDispatcher interface, Include() and forward(), Use of RequestDispatcher, Session in Servlet, Introducing session, Session tracking mechanism, Cookies, Advantages & disadvantages, use of cookies, Hidden form filed, Advantages & disadvantages, use of Hidden form filed, URL rewritten, disadvantages, use of URL rewritten, HttpSession, Advantages & disadvantages,use of URL HttpSession

**Unit -3:- JSP** **(10)**

Introduction to JSP, Advantages of JSP over Servlet, JSP architecture, JSP life cycle, Implicit objects in JSP- request, response, out, page, pageContext, application, session, config, exception, JSP tag elements- Declarative, Declaration, scriplet, expression, action., Java Bean- Advantages & Disadvantages, useBean tag- setProperty and getProperty, Bean In Jsp, JSTL core tag: General purpose tag, conditional tag, networking tag, JSTL SQL tags, Custom tag: empty tag, body content tag, iteration tag, simple tag

**Unit -4:- Hibernate** **(5)**

Introduction Hibernate(HB), Architecture of HB, Generator classes, Steps to create application of HB:- HB with annotation, Insert ,Delete,update,retrive records from database in HB, HB web application

**Unit -5:- Struts** **(5)**

Introduction to struts, What is struts, Use of struts, Features of Struts, Architecture of struts, Steps to create application of struts

**Reference Books**


1. Java The complete Reference by Herbert Schildt
2. Java Servlet Programming by Jasan Hunter
3. Beginning Java EE5 from Novice to Professionals by K. Makhar & C. Zelenk
4. Java Server Programming by Bayross & Shah
5. Thinking in java by Brucel

# Data Communication and Networking

**Unit 1. Introduction to Data Communication & Networking (8)**

Data Communication: Components, Data Flow, Protocols & Standards, Design Issues of Layers, Connection oriented and connection less services,

Network models :- ISO-OSI reference model, TCP/IP reference model.

**Unit 2. Physical layer (10)**

Signals: Analog & Digital Signals, Period, Frequency, Phase, Amplitude, Bandwidth, Bit Rate, Bit Length, Fourier analysis.

Transmission Impairment: Attenuation, Distortion, Noise, Nyquiest Theorem, Shannon Capacity Theorem.

Transmission Media:-Guided Media-Magnetic Media, Twisted Pair, Coaxial Cable, Fiber Optic Cable,

Unguided Media:- Wireless- Radio Waves, Microwaves, Infrared, Satellite Communication

Digital Transmission: Manchester & Differential Manchester Coding, Pulse Code Modulation

Modulation:- Amplitude Modulation, Frequency Modulation, Phase Modulation

Transmission Mode: Parallel, Serial, Synchronous Transmission, Asynchronous Transmission.

Multiplexing- Frequency Division Multiplexing, Time Division Multiplexing, Wavelength Division Multiplexing.

Switching- Circuit Switching, Message Switching, Packet Switching.

**Unit 3. Data link layer (10)**

Error Detection & Correction: Types of Errors, Hamming Distance, Error Detection: Parity Check, Cyclic Redundancy Check, Checksum Check, hamming code

Data Link Control: Framing, Flow & Error Control,

Protocols: Simplex, Stop and Wait, Stop and Wait ARQ, Go Back N ARQ, Selective repeat ARQ, HDLC, Point to Point protocol.

Multiple Access Protocol: ALOHA, CSMA, CSMA/CD,

CSMA/CA Channelization, FDMA, TDMA, CDMA

**Unit 4. Network layer (7)**

Network layer Design issues, Routing Algorithm: Optimality Principle, Shortest Path

Routing, Distance Vector Routing, Link State Routing.

Congestion Control Algorithm: General principle of congestion control, Congestion

prevention policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets

Network Devices-Hubs, Switches, Repeaters, Bridges, Routers, Gateways

**Unit 5: Transport, Session, Presentation & Application layers (5)**

TCP/IP protocol suite :- UDP,TCP,SCTP, IP, RTP, FTP, DNS, TELNET, SMTP, POP, HTTP, WWW, SNMP,ARP, RARP.

Data Compression:-Audio Compression, Video Compression

**Reference Books:**

1. Computer Networking by Tannenbaum.
2. Data communication and networking by William Stallings
3. Data communication and networking by B A Forouzan
4. Data communication and networking by Jain

# Elective

## AngularJS

**Unit-1:- Overview of AngularJS** **(3)**

What is AngularJS?, Why AngularJS?, Features of AngularJS, AngularJS architecture, Setting up the Environment, Model-View-Controller explained, My first AngularJS app

**Unit-2:- Directives** **(5)**

Introduction to Directives, Directive lifecycle, Using AngularJS built-in directives, Core Directives, Conditional Directives, Style Directives, Mouse and Keyboard Events Directives, Matching directives, Creating a custom directive

**Unit-3:- Angular Expressions** **(4)**

All about Angular expressions, How to use expressions, Number and String Expressions, Object Binding and Expressions, Working with Arrays, Forgiving Behaviour, Angular expressions v/s Javascript expressions

**Unit-4:- Controller** **(4)**

Role of a Controller, Attaching properties and functions to scope, Nested Controllers, Using filters in Controllers, Controllers in External Files, Controllers & Modules, Controllers

**Unit-5:- Filters** **(4)**

Built-in filters, Uppercase and Lowercase Filters, Currency and Number Formatting Filters, OrederBy Filter, Filter Filter, Using AngularJS filters, Creating custom filters

**Unit-6:- AngularJS Modules** **(4)**

Introduction to AngularJS Modules, Module Loading and Dependencies, Creation vs Retrieval, Bootstrapping AngularJS

**Unit-7:- AngularJS Forms** **(4)**

Working with Angular Forms, Model binding, Understanding Data Binding, Binding controls to data, Form controller, Validating Angular Forms, Form events, Updating models with a twist, $error object

**Unit-8:- Scope** **(4)**

What is scope, Scope lifecycle, Two way data binding, Scope inheritance, Scope & controllers, Scope & directives, $apply and $watch, Rootscope, Scope broadcasting, Scope events

**Unit-9:- Single Page Application(SPA)** **(4)**

What is SPA, Pros & Cons of SPA, Installing the ngRoute module, Configure routes, Passing parameters, Changing location, Resolving promises, Create a Single Page Application

**Unit-10:- AngularJS Animation** **(4)**

ngAnimate Module, CSS transforms, CSS transitions, Applying animations, Directives supporting animation

**Reference Books**


1. Professional AngularJS by Diego Netto and Valeri Karpov-Wrox press
2. Learning AngularJS by Brad Dayley- Addison-Wesley Professiona
3. AngularJS by Brad Green and Shyam Seshadri- O'Reilly
4. Pro AngularJS by Adam Freeman-APress
5. Learning AngularJS: A Guide to AngularJS Development by Ken Williamson- O'Reilly Media
6. Beginning AngularJS by Andrew Grant-Apress

# Elective

## Linux

**Unit 1: Introduction of Linux:-** **(10)**

History of Linux, Architecture of Linux system & features, Kernel, Shell & its type, Difference between Windows and Linux. Linux Distributions, Working environments: KDE, GNOME, Xface4, Hardware requirement, Installation procedure of Linux, Create partitions, Configuration of X system

Users & Groups Management:- Create Users, Create groups, Special groups, Assigning permissions to users and Groups, File and Directory permissions- chmod, chown, chgrp.

**Linux File System:-**Hierarchy of File system, File System parts- Boot Block, Super Block, Inode Block, Data Block, File types, Devices and Drives in Linux, Mounting devices (CD/DVD, usb, hard drive partition ), file system

**Unit 2: Linux Command** **(15)**

**Linux commands** File and directory Management Commands:-mkdir, rmdir, cd and pwd, file, ls, cat, more, less, File and Directory Operations: find, cp, mv, rm, ln etc, Printing the files - lpr, lpq, lprm etc.

**Filter Commands & Editor:-** Filters: head, tail , pr, cut, paste, sort, uniq, tr, grep, egrep, fgrep, sed.

**Communication commands:-** mesg, talk, write, wall, mail.

**Text Editors-** vi, vim

Archive and File compression commands

**Shell Programming:-** Shell Variables, Meta characters, Shell Scripts – Control and Loop structure, I/O and Redirection, Piping,

**Unit 3: Linux System Management** **(15)**

**Process Management:** Shell process, Parent and children, Process status, System process, Multiple jobs in background and foreground, Changing process priority with nice. Listing processes, ps, kill, premature termination of process.

**Disk management and System Administration:-**Disk Partitioning-RAID, LVM etc., disk related Management Tools- Fdisk, Parted etc. , Boot Loaders-GRUB, LILO, Custom Loaders,

System administration – Role of system administrator, identifying administrative tasks & files, Configuration and log files, Chkconfig, Security Enhanced Linux, Installing and removing packages with rpm command

**Linux Networking:-** Networking services and Configuration files, starting services, Network tools-ping, finger, traceroute, who, host, rlogin, slogin, rcp, rsh, ssh. NFS and NIS.

**Understanding various Servers**:- DHCP, DNS, Squid, Apache, Telnet, FTP, Samba.

**References :**


1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. UNIX for programmers and users by Graham Glass & King Ables, Pearson Education
3. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India
4. Red Hat Linux Bible by Cristopher Negus, Wiley Dreamtech India
5. UNIX Shell Programming by Yeswant Kanethkar, BPB

# SOLAPUR UNIVERSITY, SOLAPUR


NAAC Accredited-2015
'B' Grade (CGPA 2.62)

## Name of the Faculty-Science

## Syllabus-(CBCS Pattern)

## Name of the Course-B.Sc.-III

## (Semester V & VI)

# Microbiology

### General Structure as per CBCS

### With effect from June-2018

# Solapur University, Solapur
# Faculty of Science
# Choice Based Credit System

(W.e.f. June, 2018)

• **Title of the Course:** B.Sc.- Part III

• **Subject :Microbiology**

## • Choice Based Credit System:

With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing under graduate degree, Solapur University has implemented Choice Based Credit Systemof Evaluation at Undergraduate level. Credit is a numerical value that indicates student's work load (Lectures, Lab work, Seminars, Tutorials, Field work, etc.) to complete a course unit. In most of the universities 15 contact hours constitute one credit. The contact hours are transformed into Credits. As per present norms, there are 4 contact hours per paper (subject) per week which works out to be **60** contact hours per paper (subject) per semester.

In Solapur University, for B. Sc.-III, there are 8 papers of the subject and Compulsory English paper. For B. Sc.-III, there are the 12 contact hours for 4 papers of subject per week. Therefore, total 3 contact hours per week for each paper. Each subject has **180** contact hours, which are transformed into 12 credits. As there are 4 contact hours per week for Compulsory English, 4 credits shall be assigned for Environmental Studies. Moreover, the grading system of evaluation is introduced for B. Sc. course, wherein process of Continuous Internal Evaluation is ensured. The candidate has to appear for Internal Evaluation of 30 marks and University Evaluation for 70 marks. It is 70 + 30 pattern of evaluation. It is applicable for theory and practical as well. The details regarding this evaluation system are as under.

**• Conversion of marks into Grades :**

A table for the conversion of the marks obtained by a student in each paper (out of 100) to grade and grade points is given below.

| Sr. No | Range of Marks | Grade | Grade Point |
|---|---|---|---|
| 1. | 80-100 | O | 10 |
| 2. | 70-79 | A+ | 9 |
| 3. | 60-69 | A | 8 |
| 4. | 55-59 | B+ | 7 |
| 5. | 50-54 | B | 6 |
| 6. | 45-49 | C+ | 5 |
| 7. | 40-44 | C | 4 |
| 8. | <39 | FC | 0 (Failed in Term Exam) |
| 9. | <39 | FR | 0 (Failed in Internal Assesment) |



### 1. Grade Point Average at the end of the Semester (SGPA)

$$SGPA = \frac{(G_1 x C_1) + (G_2 x C_2) + \ldots\ldots}{\Sigma Ci}$$

(ΣCi- The total number of credits offered by the student during a semester)

**2. Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{(G_1 x C_1) + (G_2 x C_2) + \ldots\ldots}{\Sigma Ci}$$

Σ Ci - the total number of credits offered by the student upto and including the semester for which CGPA is calculated.)

**3. Final Grade Point Average (FGPA)** will be calculated in the similar manner for the total number of credits offered for completion of the said course.

Where: Ci: Credits allocated for the ith course

Gi: Grade point scored in ith paper (Subject)

**4. Conversion of average grade points into grades:**

**SGPA/CGPA/FGPA Letter Grade**

**9.5 – 10 O**

**8.5 -9.49 A+**

**7.5 – 8. 49 A**

**6.5 – 7.49 B+**

**5.5 – 6. 49 B**

**4.5 – 5. 49 C+**

**4.0 – 4. 49 C**

**< 3.99 FC /F**

**FR**



# Solapur University, Solapur

# Faculty of Science

## Credit System Structure for B.Sc.III Microbiology

## Semester V

***** Total credits excluding Compulsory English

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination

UA (University Assessment): University Theory paper shall be of 70 marks for 2.30 hrs duration

CA (College Assessment): The internal examination for Theory and Practical course.

| Class | Sem | Subject | No. of Papers/ practicals Hrs/Week | | | Paper Marks | | Credits | Total credits | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P | * | UA | CA | | |
| B.Sc.III | V | English | - | - | - | - | - | - | - | - |
| | | Microbiology Paper IX | 3 | - | - | 100 | 70 | 30 | 3 | |
| | | Microbiology Paper X | 3 | | | 100 | 70 | 30 | 3 | |
| | | Microbiology Paper XI | 3 | - | - | 100 | 70 | 30 | 3 | |
| | | Microbiology Paper XII | 3 | - | - | 100 | 70 | 30 | 3 | |
| **Grand Total** | | | **12** | | | **400** | **280** | **120** | **12** | **12** |

**Solapur University, Solapur**
**Faculty of Science**
**Credit System Structure for B.Sc.III Microbiology**

## Semester VI

* Total credits excluding Compulsory English

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination

UA (University Assessment): University Theory paper shall be of 70 marks for 3.0 hrs duration

CA (College Assessment): The internal examination for theory and Practical course.

| Class | Sem | Subject | No. of Papers/ practicals Hrs/Week | | | Paper Marks UA | CA | Credits | Total credits |
|---|---|---|---|---|---|---|---|---|---|
| | | | L | T | P * | | | | |
| B.Sc.III | VI | English | - | - | - | - | - | - | - |
| | | Microbiology Paper XIII | 3 | - | - | 100 | 70 | 30 | 3 |
| | | Microbiology Paper XIV | 3 | | | 100 | 70 | 30 | 3 |
| | | Microbiology Paper XV | 3 | - | - | 100 | 70 | 30 | 3 |
| | | Microbiology Paper XVI | 3 | | | 100 | 70 | 30 | 3 12 |
| B.Sc.III | | Microbiology Practical V | - | - | 3 | 100 | 70 | 30 | 3 |
| | | Microbiology Practical VI | - | - | 3 | 100 | 70 | 30 | 3 |
| | | Microbiology Practical VII | - | - | 3 | 100 | 70 | 30 | 3 |
| | | Microbiology Practical VIII | - | - | 3 | 100 | 70 | 30 | 3 |
| Total | | | 800 | 560 | 240 | 24 | 24 | | |
| **Grand Total V& VI** | | | **1200** | **840** | **360** | **36** | | | |

6

## General Guidelines for Credit and Grading System

## B.Sc.III

1. The University follows Semester system
2. An academic year shall consist of two semesters
3. Each B.Sc. course shall consist of three years i.e. six semesters
4. Compulsory English shall remain a compulsory paper for B.Sc.Part- III students in both Semesters.
4. B.Sc.Part-III shall consist of two semesters: Semester V and Semester VI.

In semester –V, there will be four theory papers of 100 marks each for the subject. Similarly, in semester VI there will be four theory papers of 100 marks each for the subject and English paper compulsory for every student in each semester.

The scheme of evaluation of performance of candidates shall be based on University assessment as well as College internal assessment as given below. For B.Sc.Part III Sem V & VI the internal assessment will be based on Unit tests, Home assignment, viva, practical, Project Work etc as given below. Practical examination of 400 marks for 4 practical courses shall be conducted at the end of VI$_{th}$semester. The practical examination of 400 marks shall consist of 280 marks for University practical assessment and 120 marks for college internal assessment.

For University practical examination, there shall be appointment of two examiners. Both examiners shall be external and both be appointed by the University. The internal practical assessment shall be done as per scheme given below.

5. **Scheme of evaluation:**

As per the norms of the grading system of evaluation, out of 100 Marks, the candidate has to appear for College internal assessment of 30 marks and external evaluation (University Assessment) of 70 marks. Assessment scheme is given below.

**Semester - V:**

**Theory: (100 marks)**

University Examination (70 Marks): No. of Theory papers: 4 Papers/Subject and Compulsory English (Total 5 Papers)

**Internal Continuous Assessment (30 Marks):**

Scheme of Marking: 15 Marks: Internal Test

15 Marks: Home assignment/Tutorials/Seminars/ Group discussion/ Viva/Field visit/Industry visit.



**Semester - VI: (100 marks)**

**Theory:**

University Examination (70 Marks): No of Theory papers: 4 Papers/Subject and Compulsory English (Total 5 Papers)

**Internal Continuous Assessment (30 Marks):**

Scheme of Marking: 15 Marks: Internal Test

15 Marks: Home assignment/Tutorials/ Seminars/ Group discussion/ Viva/ Field visit/Industry visit.

**Practical Examination:**

University Examination (280 Marks**)**: No of Practicals: 4 Practicals /Subject

**Internal Continuous Assessment (120 Marks):**

Scheme of Marking: 80 Marks: Internal Test on any four practicals, 40 Marks: Lab Journal/viva, attendance, attitude etc.

6. **Passing Standard**

The student has to secure a minimum of 4.0 grade points (Grade C) in each paper. A student who secures less than 4.0 grade point (39% or less marks, Grade FC/FR) will be declared fail in that paper (subject) and shall be required to reappear for respective paper. A student who failed in University Examination (Theory) & passed in internal assessment of a same paper (subject) shall be given FC Grade. Such student will have to appear for University Examination only. A student who fails in Internal Assessment and passed in University examination (Theory) shall be given FR Grade. Such student will have to appear for both University examination as well as internal assessment. In case of Annual Pattern/Old Semester Pattern Students/candidates from the mark scheme the candidates shall appear for the same 70 marks paper of the external examination and his performance shall be scaled to 100 marks

# Solapur University, Solapur
## Faculty of Science
## Choice Based Credit System (CBCS)
## (W.e.f.2018-19)
## Structure for B. Sc-III Microbiology

| Subject/ Core Course Microbiology | No. of papers/ Practical | Hrs/week | | | Total Marks Per Paper | UA | CA | Credits |
|---|---|---|---|---|---|---|---|---|
| | | L | T | P | | | | |
| **Class :→** | **B.Sc.- III Semester - V** | | | | | | | |
| **AECC-4 (English)** | Paper-III | 4 | | | 100 | 70 | 30 | 4 |
| **DSE-1-A** | Paper IX: MIC IX: Virology | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **DSE-2-A** | Paper X: MIC X: Agricultural Microbiology | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **DSE-3-A** | Paper XI: MIC XI: Immunology | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **SEC-1** | Paper XII: MIC XII: Industrial Microbiology- I | 3 | -- | -- | 100 | 70 | 30 | 3 |
| | **OR** | | | | | | | |
| **SEC-2** | Paper XII: MIC XII: Industrial Microbiology- II | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **Total** | | **16** | -- | -- | **500** | **350** | **150** | **16** |
| **Class :→** | **B.Sc.- III Semester - VI** | | | | | | | |
| **AECC-5 (English)** | Paper-IV | 4 | | | 100 | 70 | 30 | 4 |
| **DSE-1-B** | Paper XIII: MIC XIII: Microbial Genetics | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **DSE-2-B** | Paper XIV: MIC XIV: Microbial Biochemistry | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **DSE-3-B** | Paper XV: MIC XV: Environmental Microbiology | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **SEC-3** | Paper XVI: MIC XVI Clinical Microbiology-I | 3 | -- | -- | 100 | 70 | 30 | 3 |
| | **OR** | | | | | | | |
| **SEC-4** | Paper XVI: MIC XVI: Clinical Microbiology-II | 3 | -- | -- | 100 | 70 | 30 | 3 |
| **Total (Theory)** | | **16** | -- | -- | **500** | **350** | **150** | **16** |
| **DSE-1-A&B** | Practical V | -- | -- | 5 | 100 | 70 | 30 | 3 |
| **DSE-2-A&B** | Practical VI | -- | -- | 5 | 100 | 70 | 30 | 3 |
| **DSE-3-A&B** | Practical VII | -- | -- | 5 | 100 | 70 | 30 | 3 |
| **SEC-1,2,3,4** | Practical VIII | -- | -- | 5 | 100 | 70 | 30 | 3 |
| **Total (Pract.)** | | | | **20** | **400** | **280** | **120** | **12** |
| **Grand Total** | | **16** | | **20** | **900** | **630** | **270** | **28** |

**# Ability Enhancement Course (AECC)**
**English (Communication Skills, Environmental Science)**
**# Core Course (DSC)**
**Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology**
**# Skills Enhancement Course (SEC)**
**Geochemistry/Biochemistry/Meteorology/Plant Protection**
**# Discipline Specific Elective (DSE)**
**Chemistry/Physics/Electronics/Computer Science/Mathematics/Statistics/Botany/Zoology/ Microbiology/Geology**

# Summary of the Structure of B.Sc. Programme as per CBCS pattern

| Class | Semester | Marks-Theory | Credits-Theory | Marks-Practical | Credits-Practicals | Total - credits |
|---|---|---|---|---|---|---|
| **B.Sc.-I** | I | 900 | 24 | - | - | 24 |
| | II | 900 | 24 | 400 | 16 | 40 |
| **B.Sc.-II** | III | 600 | 18 | - | - | 18 |
| | IV | 600 | 18 | 600 | 24 | 42 |
| **B.Sc.-III** | V | 500 | 16 | - | - | 16 |
| | VI | 500 | 16 | 400 | 16 | 32 |
| **Total** | | **4000** | **116** | **1400** | **56** | **172** |

## B.Sc.Programme :

- Total Marks : Theory + Practicals = 4000 +1400 =5400
- Credits : Theory + Practicals = 116 + 56 = 172
- Numbers of Papers Theory: Ability Enhancement Course(AECC) : 05
  Skill Enhancement Course (SEC) : 04
  Theory: Discipline Specific Elective Paper (DSE): 06
  Theory: Core Course (DSC) : 28

**Total : Theory Papers:43**
**Practical: Core Course (CC) : 11**

## Abbreviations :

- L: Lectures
- T: Tutorials
- P: Practicals
- UA : University Assessment
- CA : College Assessment
- DSC: Core Course
- AECC : Ability Enhancement Course
- DSE : Discipline Specific Elective Paper

***Indicates-non credit Course**

## Important Note:

- Board of Studies in the respective subject will design the curriculum/syllabus of the paper, Skills Enhancement Course (SEC-1,2,3,4) of the Paper Number (Paper – XII,XIII,XVII,XVIII)
- For B.Sc.-I, Sem -I and II. Papers of each subject are divided as per previous pattern to give more weightage and to reduce the stress of the students.
- Combined passing for DSC-A-Paper I&II, DSC-B-Paper III&IV,DSC-C-Paper V&VI, DSC-D-Paper VII&VIII,
  For B.Sc.III-Sem-V&VI, separate passing for DSE-A, DSE-B & SEC-1,2,3,4 papers
- Combined passing for B. Sc.- II Practicals ( Practical – III & IV)
- Combined passing for B. Sc-III Pratcticals (Practical – V,VI,VIII,VIII)
- The 30 marks of College level Assessment (CA) may be distributed as , 15 Marks for Internal Test and 15 Marks for Home Assignment/seminars/Viva/industrial visit/Group discussion etc.

# B.Sc.III - MICROBIOLOY CBCS SYLLABUS Semester V

## DSE – 1- A: Paper MIC IX: Virology

**Total Credits: 3**
**Contact hrs: 45**

**Unit I Introduction and Classification of Viruses** **(9)**

A. General properties and structure of virus
B. Viroids and Prions
C. Viral classification on the basis of LHT system and as per international committee

**Unit II Reproduction of bacterial viruses** **(6)**

A. $T_4$ Bacteriophage - Lytic cycle
B. Temperate phages and lysogeny of λ phages

**Unit III Animal Viruses** (12)

A. Reproduction of Animal viruses: Adeno viruses and Influenza viruses
B. Oncogenic Viruses- i) Types of Oncogenic viruses, DNA and RNA viruses, (ii) Types of cancer, Characteristics of cancerous cells, (iii) Hypotheses of Cancer: Somatic mutation, Viral gene and Defective immunity

**Unit IV Plant Viruses** **(9)**

A. Viral plant Diseases - TMV, CMV, CaMV
B. Prevention and Control of Plant Viral Diseases

**Unit V Techniques in Virology** **(9)**

A. Isolation, cultivation,Purification and Enumeration of viruses
**B.** One step growth experimen**t**

**References:**


1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Genetics of bacteria and their viruses – William Hays
4. Virology – Biswas
5. Virology – Luria
6. Microbiology - Prescott, Harley and Klein's, Willey Sherwood Woolverton,McGraw – Hill International Edition, (2008).
7. Plant viruses- by Mathews
8. Microbiology by Davis
9. Plant diseases by Singh

## DSE – 2 – A: Paper MIC - X: Agricultural Microbiology

**Total Credits: 3**
**Contact hrs: 45**

**Unit I Introduction to Soil Microbiology** **(7)**

A. Introduction - Definition, Soil formation, types, structure and properties
B. Soil as an ecosystem
C. Soil microorganisms, types and their role

**Unit II Role of microorganisms in elemental cycle** **(9)**

A. Carbon cycle
B. Nitrogen cycle
C. Sulphur cycle
D. Phosphorous cycle

**Unit III Composting and Biodegradation** **(13)**

A. Compost production with reference to organic waste, types of microorganisms, and factors affecting - aeration, C:N:P ratio, moisture content, temperature, pH, and period of composting.
1. Green manure
2. Farm yard manure
3. Town compost
4. Vermicompost

B. Biodegradation of Cellulose, hemicelluloses, Lignin, and Pesticides

**Unit IV Plant pathology** **(9)**

A. Common symptoms produced by plant pathogens
B. Modes of transmission of Plant diseases: Oily spots on pomegranate – *Xanthomonas aoxynopodis*, white smut of sugarcane, soft rot of potato
C. Control measures of plant diseases

**Unit V Applications of Biotechnology in Agriculture** **(7)**

A. Biofertilisers (Azo and Rhizo and PSB) production and applications.
B. Bioinsecticides – *Bacillus thuriengenesis* and *Trichodermaviridae*
C. Genetically Modified Crops with examples

**References**


1. Soil Microbiology – Subbarao, N.S.
2. Microbial dynamics and diversity – Desy Staley
3. Biology of Microorganisms – Brock, Parker, Madigen, 9th edition
4. Agricultural Microbiology- Bagyaraj and Ghosh
5. Plant Diseases- Singh R.S.
6. Soil Microbiology – Alexander.
7. Industrial Microbiology – Patel A.H.
8. Textbook of Biotechnology – R.C. Dubey,

# DSE – 3 – A: Paper MIC - XI: Immunology

**Total Credits: 3**
**Contact hrs: 45**

## Unit I. Immune Response (10)

A) Adaptive Immunity
a) Humoral (antibody) mediated response –Cells involved and mechanism
b) Cell mediated – cells involved, mechanism (endogenous and exogenous pathways); cytokines and their role
c) **Monoclonal antibodies** – i) Production (hybridoma technology) ii) Applications of Monoclonal antibodies in Diagnosis, Research and Treatment

## Unit II.Major Histocompatibility complex (12)

A. Organization of MHC genes in man, Classes of MHC molecules – structure and their role,
B. HLA typing
C. Types of grafts and their rejection.

## Unit III.Complement system (05)

A. Components of complement and their properties,
B. Activation of complement –classical and alternate pathway
C. Biological effects of complement

## Unit IV Immunological disorders (12)

**A. Hypersensitivity** – Classification - based on 1. Time:Immediate and delayed type hypersensitivity
2. Mechanism of Pathogenesis

a) **Type I :** Anaphylaxis, Atopy
b) **Type II :** Autohaemolytic anemia
c) **Type III :** Arthus reaction, Serum sickness
d) **Type IV:** contact dermatitis, Allergy of infection

**B. Autoimmunity** :a. Mechanism of Autoimmunity
b. Types of Autoimmune diseases- a) Hemocytolytic b) Organ Specific (Graves disease, Myasthenia gravis) c) Non organ specific (S.L.E., R.A.)

## Unit V Immunohaematology (6)

A. ABO blood group system
B. Rh blood group system
C. Blood transfusion reaction and its complications

**References**


1. Essentials of Immunology Roitt Evan, Brostoff J. Male D. (1993) 6th Edition.
2. Immunology - Kuby J. (1996) - W.H. Freeman and Co.
3. Immunology – Fudenberg
4. Medical Microbiology - Davis and Dulbecco
5. Medical laboratory technology – RamnaikSood
6. Diagnostic Microbiology – Bailey's and Scotts
7. Immunology – a problem approach by Wood, Hood and Weison
8. Medical Bacteriology – Dey and Dey
9. Handbook of Immunology- G.P. Talwar (1983) Vikas Publishing Pvt. Ltd
10.Textbooks of medical microbiology-Anant Narayan
11.Immunolgy& Serology-Carpenter.

## SEC – 1 : Paper MIC – XII : Industrial Microbiology – I

**Total Credits: 3**
**Contact hrs: 45**

### Unit I Food Microbiology (10)

A. Food as a substrate for microorganisms
B. Food Spoilage (Meat and Poultry, Fruits and Vegetables)& food borne diseases-food infection (Salmonella) & food poisoning (Clostridium)
C. Principle and methods of food preservation
D. Food Fermentations – i) Idli ii) Bread

### Unit II Dairy Microbiology (07)

a. Spoilage of milk
b. Fermented dairy products: i) Cheese ii) curd iii) Yogurt

**Unit III Industrial production of (10)**

A. Streptomycin
B. Lysine
C. rDNA products – Insulin

**Unit IVProduction of alcoholic beverages (8)**

A. Grape wine – Definition, types, production of White table wine and Red table wine
B. Post fermentation spoilage of wines: Microbial and non microbial spoilage of wines
C. Beer – Definition, types, production of Lager beer and Ales Beer.

**Unit VDownstream processing and quality control: (10)**

**A) Downstream processing:**
Filtration, Cross flow filtration, Flocculation, Whole broth processing
Solvent extraction, Concentration, Centrifugation, Crystallization,
Distillation, Adsorption elution, Precipitation and Chromatography
**B) Quality control in fermentation industry:** Test for sterility, pyrogenicity, allergy, Carcinogenicity, toxicity for Pharmaceutical and health care and food products

**References**


1. Principles of fermentation technology – Whitkar and Stanbury
2. Pharmaceutical Microbiology – Huggo
3. Biochemistry – Fox and Nelson
4. Industrial Microbiology – Prescott and Dunn
5. Microbial technology – Peppler
6. Advances in Biotechnology – S.W. Jogdand.
7. Textbook of Biotechnology – R.C. Dubey,
8. Biotechnology – B.D. Singh
9. Industrial Microbiology – Casida
10. Industrial Microbiology by A.H. Patel.
11. Food Microbiology: an Introduction by Adam and Dick
12. Food Microbiology by Frazier

## SEC – 2 : Paper MIC – XII: Industrial Microbiology – II

**Total Credits: 1.5**
**Contact hrs: 23**

**Unit I: Industrial Sterilization and Control of Contamination (10)**

A) Sterilization of
   1. Bioreactor
   2. Other Mechanical System
   3. Fermentation Media

B) Control of Contamination

**Unit II : Specific Fermentations (07)**

A) Amylase
B) Vitamin B 12
C) Citric Acid

**Unit III : Fermented Food Products (08)**

A) Fermented Food – Idli, Bread
B) Dairy Product – Cheese, Yogurt

**Unit IV: Downstream processing (10)**

Filtration, Cross flow filtration, Flocculation, Whole broth processing, Solvent extraction, Concentration, Centrifugation, Crystallization, Distillation, Adsorption elution, Precipitation and Chromatography

**Unit V: Recent Trends in Fermentation Industry (10)**

A) Fermentation Economics
B) Biosafety and Bioethics

**References**


1. Principles of fermentation technology – Whitkar and Stanbury
2. Pharmaceutical Microbiology – Huggo
3. Industrial Microbiology – Prescott and Dunn
4. Microbial technology – Peppler
5. Advances in Biotechnology – S.W. Jogdand.
6. Textbook of Biotechnology – R.C. Dubey,
7. Biotechnology – B.D. Singh
8. Industrial Microbiology – Casida
9. Industrial Microbiology by A.H. Patel.
10. Food Microbiology by Frazear
11. An Introduction to Industrial Microbiology By S. Chand and Company Ltd.
12. Industrial Microbiology by Agrawal

# Semester VI

## DSE – 1 – B:PaperMIC - XIII: Microbial Genetics

**Total Credits:3**
**Contact hrs: 45**

**Unit I: Basic concepts of microbial genetics** (9)
A) Structural organization of *Escherichia coli* chromosome, folded fiber model
B) Replication of DNA: Enzymes involved and mechanisms of replication
C) Transcription: RNA polymerase enzyme, process and post transcriptional modification
D) Operon concept – Lac Operon

**Unit II: Effect of mutation in bacteria** (10)
A) Effect of mutation on translation
B) Effect of mutation on phenotypes
C) Time course of phenotypic expression
D) Selection, detection and Isolation of mutants
E) Genetic Complementation – Cis – Trans Test

**Unit III: Genetic engineering and Protein engineering** (12)
A) Introduction, Tools and Techniques of Genetic engineering
B) Applications of Genetic engineering
C) Protein Engineering – concept and applications

**Unit IV : Techniques in molecular biology** (8)
A) Electrophoresis of DNA.
B) DNA sequencing – Sanger Dideoxy method
C) DNA finger printing- method and applications

**Unit V Bioinformatics** **(06)**
A. Introduction to Bioinformatics.
B. Introduction to major bioinformatics resources on Internet: National Centre for Biotechnology Information (NCBI), DDBJ, EMBL.
C) Protein data bank (PDB) and Nucleic acid sequence database (GenBank)
D) The Basic Local Alignment Search Tool (BLAST)

**References:**


1. General microbiology – Stanier
2. General microbiology – Pawar and DaginawalaVol I and II
3. Biochemistry – Lehninger
4. Molecular Biology of Gene – J.D. Watson
5. Recombinant DNA – J.D. Watson
6. Microbiology - Davis
7. Biochemistry - Purohit
8. Genetics of bacteria and their viruses – William Hays
9. http://www.ncbi.nlm.nih.gov/

## DSE – 2 – B: Paper MIC - XIV: Microbial Biochemistry

**Total Credits:3**
**Contact hrs: 45**

**Unit I Enzyme, Enzyme kinetics and regulation** **(12)**

A) **Enzymes**:
(i) Definition, properties, structure, specificity, mechanism of action (Lock and key model, induced fit hypothesis)
(ii) Allosteric enzymes – Definition, Two models explaining mechanism of action (Sequential and Concerted)
(iii) Ribozymes and Isozymes
iv) Factors affecting catalytic efficiency of enzymes
i) Proximity, orientation ii) Strain and distortion iii) Acid base catalysis iv) Covalentcatalysis
B) **Enzyme kinetics** – Derivation of MichaelisMenten equation, Significance of Km and Vmax
**C) Regulation of enzyme synthesis**
i) Positive control – Arabinose Operon ii) End product repression – Tryptophan Operon
iii) Catabolite repression

**Unit II Extraction, purification and assay of enzymes** **(6)**

A) Cell disruption and homogenization of membrane bound enzymes, Extraction
B) Purification of enzymes on the basis of - i) Molecular size ii) Solubility
iii) Electric charge iv) Adsorption characteristics) Biological affinity
C) Immobilization of enzymes – Methods and applications
D) Assay of enzymes (enzyme unit, enzyme activity, Specific activity)

**Unit III Assimilation of**: **(7)**

A. Carbon
B. Nitrogen – N2 and NH3 (GOGAT)
C. Sulphur

**Unit IV Bioenergetics:**

A) Pyruvate as key metabolite in Carbohydrate metabolism **(8)**
B) Metabolic Pathways
i) PP Pathway
ii) Phosphoketolase pathway
**C)** Bioluminescence

**Unit V Biosynthesis of:** **(12)**

A) Nucleotides B) Protein C) Peptidoglycan

**References:**


1. Molecular Biology of Gene – J.D. Watson
2. Principles and techniques of Practical Biochemistry – K. Wilsons J.Walkar.
3. Analytical Chemistry – Robert B. Dilts
4. Chromatographic methods by Braithwaite and White
5. Outline of Biochemistry – Cohn and Stump
6. Biochemistry – West and Todd Russel
7. Biochemistry – Lehninger
8. Enzymes – Dixon and Web
9. Biological chemistry – Mahler and Cordes
10. Nature of Enzymology – R.L. Foster
11. Microbial technology – Peppler
12. Biochemistry – A problem approach by Wood, Hood and Weison

## DSE – 3 – B Paper MIC - XV: Environmental Microbiology

**Total Credits: 3**
**Contact hrs: 45**

**Unit I Air microbiology** **(9)**

A) Microorganisms in air – Launching, transport and deposition of aerosols, survival of microorganisms in air
B) Significance of microorganisms in air (extramural and intramural)
C) Methods to study air borne microorganisms. Sampling, qualitative and quantitative methods.
D) Bioaerosal control (ventilation, filtration, biocidal control, UV gaseous (quarantine)
E) Sources, types, effects, control of air pollution.
Depletion of ozone layer (causes, impact and control)
F) Biological safety
G) Germ free animal and Gnotobiology

**Unit II A) Marine microbiology and Fresh water ecosystem** **(9)**

A. Microorganisms in marine water, methods to study aquatic microorganisms. Characteristics of marine environment, types of organisms and their role.
B. Fresh water ecosystem : Eutrophication, Types of fresh water bodies a) Classification of lakes b) Sources c) Consequences d) Control

**Unit III Extremophiles:** **(9)**

General characteristics of extremophiles and their role -
Acidophiles, Alkalophiles, Thermophiles, Psychrophiles, Barophiles and Osmophiles

**Unit IV Environmental impact assessment and Industrial Waste Management:** **(9)**

A)Types of wastes, Waste water assessment and management, BOD, COD,
B. **Industrial waste treatment** : Characteristics and treatment of wastes from different industries, – paper and pulp, sugar and distillery, textile, and dairy industries,
C) Bioremediation :Lead, mercury, arsenic and radioactive substances

**Unit V Geomicrobiology** **(9)**

**A)** Introduction, Microorganisms involved, Biochemistry of microbial leaching,
Commercial leaching – slope, heap, in situ leaching, Leaching of Iron, Copper and Uranium,
B) Oilrecovery: Methods – primary, secondary, and microbially enhanced oil recovery,

**References:**


1. Physiology and Biochemistry of Extremophiles- Charles Gerday and Nicolas Glansdorff
2. Environmental Microbiology – Maier
3. Microbial ecology – Fundamentals and applications - Atlas and Bartha
4. Microbial dynamics and diversity – Desy Staley
5. Biology of Microorganisms – Brock, Parker, Madigen, 9th edition
6. Microbiology – Prescott and Harley, 5th edition

## SEC – 3 – Paper MIC - XVI: Clinical Microbiology - I

**Total Credits:1.5**
**Contact hrs: 23**

**Unit I : Clinical Bacteriology** **(13)**

(Morphological, cultural and biochemical characters, antigenic structures, modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases)

*1. Pseudomonas aeruginosa 2.Mycobacterium leprae 3.Helicobacter pyelori 4.Treponemapallidum 5. Clostridium perfringens 6. Mycobacterium tuberculosis 7.Vibrio cholera 8. Leptospirosis 9. Rickettsiarickettsiae (Epidemic Typhus Fever)*

**Unit II Clinical Mycology** (Morphology, cultural and biochemical characters, antigenic structures, modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases **(05)**

1. Candidiasis
2. Aspergillosis
3.

**Unit III Clinical Parasitology**

(Morphology, cultural and biochemical characters, antigenic structures, modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases) **(06)**

1. Malaria
2. Giardiasis
3. Amoebiasis
4.

**Unit IV Clinical Virology** **(11)**

(Morphology, cultural and biochemical characters, antigenic structures, modes of transmission, pathogenesis, symptoms, laboratory diagnosis, prophylaxis and treatment of following diseases)

1.Herpes (Simplex) 2. Rabies 3.Hepatitis A and B 4.AIDS 5.Swine flu 6. Ebola

**Unit V Chemotherapy** **(10)**

A) Antimicrobial Drugs
B) Properties of ideal Antimicrobial drugs
C) Mode of action of following antimicrobial drugs:
i. Acting on Cell Wall: Penicillin, Bacitracin, Vancomycin,
ii. Acting on Protein Synthesis: Streptomycin, Chloramphenicol,
iii. Acting on nucleic acid synthesis: quinolenes, rifampicin
iv. Drugs Acting on folic acid synthesis: Sulphonamide, Trimethoprim,
v. Antiviral drug: Azidothymidine,
vi. Antifungal Drugs:Amphotericin, Nystatin
D) Methods of antibiotic sensitivity testing : i) Disc diffusion ii) MIC determination
E) Mechanisms of drug resistance

**References:**


1. Pharmaceutical Microbiology – Huggo
2. Text book of Medical Microbiology – Ananthnarayan
3. Review of Medical Microbiology – Jawetz et al
4. Microbiology – Zinsser
5. Medical Microbiology – Cruickshank
6. Medical Microbiology - Davis and Dulbecco
7. Parasitology – Chattergii
8. Medical laboratory technology – RamnaikSood
9. Diagnostic Microbiology – Bailey's and Scotts
10. Medical Bacteriology – Dey and Dey

## SEC – 4– Paper MIC - XVI: Clinical Microbiology - II

**Total Credits:1.5**
**Contact hrs: 23**

**Unit I Biomedical Waste Management** **(06)**
Laboratory disposal of – Sharp devices, Smeared Slides, Cultures, Culture Media and Clinical Samples, Fomites

**Unit IIAutomation in Bacteriology** **(06)**
Introduction, BACTEC System, ATB System, ViTEK System, API System

**Unit IIIEpidemiology** **(12)**
A) Basics of Epidemiology
B) Emerging and re-emerging diseases
C) Mechanism of emergence of new pathogens – 1. Microbial Change and Adaptation 2. Horizontal Gene Transfer 3. Pathogenecity Islands
D) Control of Epidemics – a) Control of Transmission b) Control by Isolation c) Community based Control by Vaccination d) Public Health Organization for control – Introduction of CDC, WHO
E) Bioterrorism
F) Molecular Epidemiological Tools – Biotyping, Serotyping, Phage Typing, Ribotyping, RFLP and PCR

**Unit IV Nosocomial Infection**(Etiology, Transmission, Clinical Features, Laboratory Diagnosis, Prophylaxis and treatment) **(16)**
A) Bacterial :*Streptococcus pyogenes*, *Staphylococcus aureus*, *E. coli*, *Proteus spp.*, *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Mycobacterium tuberculosis*
B) Viral :HIV, Hepatitis, Swine Flu, Herpes
C) Fungal : Candidiasis, Aspergillosis
D)Protozoal :Malaria, Amoebiasis

**Unit VVaccines** **(05)**

a) Types
    1. Attenuated, Live
    2. Killed
    3. Toxoids
    4. Subunit Toxins
    5. Recombinant
    6. DNA
    7. Conjugated
b) Adjuvant

**References:**


1. Microbiology by Prescott, Harley and Klein, McGraw Hill Int.Edn.
2. Microbiology : An Introduction by Tortora, Funke and Case (Pearson Edn.)
3. Textbook of Microbiology by Anantnarayan and Panikar
4. Textbook of Medical Laboratory Techniques (Clinical Laboratory Science and Molecular Diagnosis) by Praful B. Godkar and Darshan P. Godkar

## PRACTICAL COURSE

**Practical V:** **Total Credits: 3**
**Contact hrs: 75**

1. Isolation of DNA from bacteria by J. Marmur's method
2. Electrophoretic separation of DNA
3. Isolation of coliphages from sewage
4. One step growth curve
5. Determination of dose of U.V. by UV survival curve
6. Isolation of Lac negative mutants of *E.coli* by visual detection method.
7. Isolation of Streptomycin resistant mutants by gradient plate technique.
8. Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
9. Cultivation of Viruses in Embryonated chicken egg
10. Study of Virally infected lesions of Plant materials
11. Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites.
12. Exploring protein sequence database (PDB) and GeneBank and BLAST.

**Practical VI:** **Total Credits: 3**
**Contact hrs: 75**

1. Isolation of **Azotobacter**from soil. (Identification up to genus level)
2. Isolation of ***Rhizobium*** from root nodules.
3. Isolation of ***Xanthomonas***from infected plant material
4. SPC of market **Biofertilizers.**
5. Estimation of available phosphorous from soil (Stannous chloride method)
6. Estimation of Calcium and Magnesium from soil (EDTA method)
7. Determination of organic carbon contents of soil (Walkley and Black method)
8. Diauxic growth curve of Escherichia coli (glucose and lactose).
9. Immobilization of enzyme by using Sodium alginate
10. Thin layer chromatography- amino acid
11. Study of Substrate concentration on enzyme activity.
12. Purification of enzyme by dialysis and study of its activity

**Practical VII:** **Total Credits: 3**
**Contact hrs: 75**

1. Study of Phagocytic index
2. Separation and Preservation of Serum and Plasma
3. Widal test (quantitative test), RA test, Pregnancy test
4. Haematology – RBC count, WBC count, differential WBC count, Erythrocyte sedimentation
5. Immunodiffusion test.
6. VDRL Test
7. Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test
8. Determination of potability of water by MPN.
9. Waste water analysis: Chemical Oxygen Demand (COD)
10. Biological Oxygen Demand (BOD)
11. Study of Microflora from air (With reference to Morphological Characters)
12. Isolation of Thermophilic Bacteria

**Practical VIII:**
**A)**

1. Examination of milk **i)** DMC **ii)** Quantitative analysis of milk by SPC (using nutrient agar)
2. Phosphatase Test (qualitative)
3.Study of bacteria from spoiled food
4. Bioassay of Penicillin
5. Production of wine by using Jaggery medium by ***S. cerevisiae***- examination of pH, colour, taste.
6. Estimation of alcohol by using $K_2Cr_2O_7$

**B)**
1.Production of citic acid by Aspergillusniger and estimation of Citric acid by titration method
2. SPC Of Idli batter.
3. Bioassay of Vitamin $B_{12}$
4. Sterility testing of media and pharmaceutical products
5.Isolation of Lactic acid Bacteria (MRS Medium)
6.Amylase assay (Iodometric method)

**C)**
1Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*
2.Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% H2O2, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli, Staphylococcus aureus, Bacillus*) by disc diffusion method
3.Antimicrobial susceptibility testingby disc diffusion method
4.Study of synergistic action of antibiotics
5Determination of minimum inhibitory concentration (MIC).of penicillin on *S.aureus.*
6.Urine analysis : Microscopic examination – pus cells, RBc, bacteria, crystals. Chemical examination – glucose (benedict's method, protein (acetic acid), bile salt (sulphur method), Bile pigment (Fauchet's method) ketone bodies (Rothera's test)

**D)**
1.Isolation of pathogen from clinical sample *Klebsiella pneumoniae*
*2*Isolation of pathogen from clinical sample *Staphylococcus aureus*
3Detection of malarial parasites in blood smears by Leishmans method
4.Preparation of killed TAB vaccine.
5.Isolation and study of cultural characteristics of pathogens from water.
6.Disposal of clinical specimens-sputum,urine,pus,blood and stool

## Practical Examination

A) The university practical examination will be conducted on four (4) consecutive days for not less than 6 hours on each day of the practical examination. The practical examination shall be conducted by the two external examiners appointed by the University.
B) Each candidate must produce a certificate from the Head of the Department in his/her college stating that he/she has completed in a satisfactory manner the practical course on the guidelines laid down from time to time by Academic council on the recommendation of Board of studies and has recorded his/her observations in the laboratory journal and written a report on each exercise performed. Every journal is to be checked and signed periodically by a member teaching staff and certified by the Head of the Department at the end of the year. Candidates are to produce their journal at the time of practical examination. Candidate has to visit two places of Microbiological interest (Pharmaceutical industry, Dairy, Research institutes etc) and submit the report of their visit at the time of examination. The report should be duly certified by the Head of the Department.

**Distribution of Marks for practical examination**
For practical V VI VII each.
1) One major experiment: 30 marks
2) Two minor experiment: 15 marks each
3) Journal: 5 marks
For practical VIII .( Two out of A,B,Cand D)For each
1) One major experiment: 15 marks
2) One minor experiment: 8 marks
3) One minor experiment: 7 marks
4)Journal:2.5 marks

**Total marks:**
Practical V: 65 Marks
Practical VI: 65 Marks
Practical VII: 65 Marks
Practical VIII: 2x 32.5=65 Marks
Tour Report : 20 Marks
**Total Marks: 280**

**Practical wise distribution of marks for examination**
**Practical V:**
**Q1** (MARKS 30)
Isolation of coliphages from sewage
OR
Isolation of Lac negative mutants of *E.coli*by visual detection method.
OR
Isolation of Streptomycin resistant mutants by gradient plate technique.
OR
Isolation of Vitamin B12 requiring (auxotrophic) mutants by replica plate technique.
**Q2(MARKS 15)**
Electrophoretic separation of DNA
OR
Determination of dose of U.V. by UV survival curve
OR
Study of Virally infected lesions of Plant materials
OR
Exploring protein sequence database (PDB) and GeneBank and BLAST.
**Q3(MARKS 15)**
Isolation of DNA from bacteria by J. Marmur'smethod .
OR
One step growth curve
OR
Cultivation of Viruses in Embryonated chicken egg .
OR
Browsing of National Centre for Biotechnology Information **(**NCBI**),** DDBJ and EMBL websites.
Q4 Journal (MARKS 5)

**Practical VI:**

**Q1**(MARKS 30)

Isolation of **Azotobacter**from soil. (Identification up to genus level

OR

Isolation of ***Rhizobium*** from root nodules.

OR

Isolation of ***Xanthomonas***from infected plant material

OR

SPC of market **Biofertilizers.**

**Q2(MARKS 15)**

Diauxic growth curve of Escherichia coli (glucose and lactose)..

OR

Immobilization of enzyme by using Sodium alginate .

OR

Study of Substrate concentration on enzyme activity. .

OR

Purification of enzyme by dialysis and study of its activity .

Q3**(MARKS 15)**

Estimation of available phosphorous from soil (Stannous chloride method) .

OR

Estimation of Calcium and Magnesium from soil (EDTA method) .

OR

Determination of organic carbon contents of soil (Walkley and Black method) .

OR

Thin layer chromatography- amino acid .

Q4 Journal (MARKS 5)

**Practical VII:**

Q1.(MARKS 30)

Microbiological analysis Drinking water: Presumptive, Confirmed and Completed test

OR

Waste water analysis: Chemical Oxygen Demand (COD)

OR

.Biological Oxygen Demand (BOD)

OR

. Isolation ofThermophilic Bacteria

Q2**(MARKS 15)**

Study of Phagocytic index .

OR

Separation and Preservation of Serum and Plasma .

OR

VDRL Test .

OR

Determination of potability of water by MPN..

Q3**(MARKS 15)**

Widal test (quantitative test), RA test, Pregnancy test .

OR

.Haematology :RBC count, WBC count, differential WBC count, Erythrocyte sedimentation.

OR

Immunodiffusion test..

OR

Study of Microflora from air (With reference to Morphological Characters).

Q4 Journal (MARKS 5)

**Practical VIII:**

**A)**

Q1)(MARKS 15)

Quantitative analysis of milk by SPC (using nutrient agar)

. OR

Bioassay of Penicillin

Q2.(MARKS 8)

Study of bacteria from spoiled food .

OR

Production of wine by using Jaggery medium by ***S. cerevisiae***- examination of pH, colour, taste.

OR

Estimation of alcohol by using $K_2Cr_2O_7$.

Q3(MARKS 7)

Examination of milk **i)** DMC

OR

Phosphatase Test (qualitative)

**B)**

Q1.(MARKS 15)

SPC OfIdli batter.

OR

Isolation of Lactic acid Bacteria

Q2.(MARKS 8)

Bioassay of Vitamin $B_{12}$

OR

Amylase assay (Iodometric method)

Q3(MARKS 7)

Sterility testing of media and pharmaceutical products .

OR

Production of citic acid by Aspergillusniger and estimation of Citric acid by titration method

**C)**

Q1(MARKS 15)

Isolation of pathogen from clinical sample *Pseudomonas aeruginosa/E.coli*

OR

Study of determination of effectiveness of antiseptic agents (– tincture iodine, 3% H2O2, 70% alcohol, 5% chlorine bleach) against selected organisms (*Escherichia coli, Staphylococcus aureus, Bacillus*) by disc diffusion method

Q2.(MARKS 8)

Study of synergistic action of antibiotics .

OR

Urine analysis : Microscopic examination – pus cells, RBc, bacteria, crystals. Chemical examination – glucose (benedict's method, protein (acetic acid), bile salt (sulphur method), Bile pigment (Fauchet's method) ketone bodies (Rothera's test) .

Q3(MARKS 7)

Antimicrobial susceptibility testingby disc diffusion method .

OR

Determination of minimum inhibitory concentration (MIC).of penicillin on *S.aureus.*

**D)**
Q1(MARKS 15)
Isolation of pathogen from clinical sample *Klebsiellapneumoniae*
OR
Isolation of pathogen from clinical sample *Staphylococcus aureus*
Q2.(MARKS 8)
Preparation of killed TAB vaccine..
OR
Isolation and study of cultural characteristics of pathogens from water.
Q3(MARKS 7)
Disposal of clinical specimens-sputum,urine,pus,blood and stool .
OR
Detection of malarial parasites in blood smears by Leishmansmethod .

## List of the Minimum equipments and related requirements for B.Sc – III

1) Replica plating units for genetics experiments: Two
2) Rotary shaker for fermentation experiments: One
3) Centrifuge (High speed): One
4) Hot plate: One
5) Hot air oven: One
6) Bacteriological incubator: One
7) Spectrophotometer: One
8) Research Microscope: one for each student
9) Haemocytometer: Two
10) Haemoglobinometer: Two
11) ESR stands and tubes: Two
12) Separate room for fine instruments of size 10'×15' feet dimension
13) A separate culture room of at least 10'×10' feet dimension
14) Electrophoresis assembly: One
15) Laminar air flow cabinet: One
16) Distillation assembly: One (Glass)
17) Reflux assembly: Four
18) Serological water bath: One
19) Colony counter: One
20) Refrigerator: One
21) TLC UNIT: One
22) Hand Refractometer
23) Computer with Internet facilities and printer: One
24) Micropipette: One
25) Anaerobic Jar: One
26) Heating Mantle: One
27) UV Chamber