Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B++' Grade (CGPA 2.96)

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 June 2022)

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 40 marks for university examination and 10 marks for internal examination for each paper.
- Practical examination will be conducted at the end of academic year
  The weightage of practical is of 80 marks for university 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
	I	Chemistry Practical	04 hr /Week	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

Chemistry Practical paper has 80 marks for university practical examination. Duration of practical examination is **one day**. There will be two practicals, (P+I/ I+O/O+A/A+P) of 30 marks each. Nature of practical question paper will be as follows,

Q. 1. Solve any TWO from the given below: (30+30) Marks
- Physical Chemistry experiment : 30 marks
- Inorganic Chemistry experiment : 30 marks
- Organic Chemistry experiment : 30 marks
- Analytical Chemistry experiment : 30 marks

Q. 2. Certified Journal : 10 Marks

Q. 3. Oral : 10 Marks

Total Marks :80 marks

- **Continuous Internal Assessment :**
  1) Each theory paper has 10 marks for internal examination.
  2) Practical paper has 20 marks for internal examination.

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SEMESTER-I

PAPER –I (Physical Chemistry)

Learning Objectives:

- To acquire knowledge about rates of chemical reactions and distinguishing the reaction of a different order and their characteristics.
- To get information about thermodynamics and its process.
- To learn mathematical concepts such as graphical representation, derivative, and integration.
- To achieve knowledge of the gases states such as ideal and non-ideal gases, isotherm, and liquefaction of gases.

Course Outcome: After successful completion of this course, students are expected to:

- Understand the significance of rates of chemical reactions.
- Able to understand second law thermodynamics and Carnot cycle and its efficiency.
- Able to the knowledge of mathematical concepts.
- Also, get a better understanding gaseous state.

(Total Credits: 2; Contact hrs: 30) **Marks: 50 (40+10)**

Unit I **(Contact hrs: 15)**

1. Mathematical Concepts **(Contact hrs: 04)**

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

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

1.3 Integration: Types of integration, Rules of Integration (without proof) pertaining to algebraic and exponential functions. Examples related to chemistry. (Numerical Problems not expected)

2. Gaseous State: **(Contact hrs: 11)**

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

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

2.3 Liquefaction of gases, Joule-Thomson effect.

2.4 Numerical Problems

Unit II **(Contact hrs: 15)**

1. Chemical Kinetics **(Contact hrs: 11)**

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: with example of Ammonia synthesis by Haber's Process.
1.2 Order and Molecularity of reaction.
1.3 First order reaction: Derivation of Rate constant, Characteristics of first order reaction,
Example: 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, Example: Reaction between $K_2S_2O_8$ and KI
1.5 Pseudo-uni-molecular reaction, Example: Hydrolysis of methyl acetate in presence of acid.
1.6 Numerical Problems

2. Thermodynamics: **(Contact hrs: 04)**
2.1 Spontaneous and non spontaneous processes, Second law of thermodynamics and it's statements.
2.2 Carnot's Theorem (Heat engine), Carnot cycle and its efficiency.
2.3 Numerical Problems

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 :Alberty R. A. and Silbey, R.J.John Wiley and Sons, 1992

11) Principles of Physical Chemistry :B. R. Puri, L.R. Sharma and M.S.Patania, S.L.N. Chand & Co. 1987

12) Basic Chemical Thermodynamics : V. V. Rao.

13) University General Chemistry : CNR. Rao (McMillan)

14) Physical Chemistry Through problems : Dogra and Dogra (Wiley Eastern Ltd.,)

15) Physical Chemistry : S. Glasstone.

16) Physical Chemistry(3rd Edition) - Gilbert W. Castilian, Narosa Publishing House,1985

17) Chemical Kinetics by K. J. Laidler, Tata McGraw Hill Publishing Co., New Delhi.

18) Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York.

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SEMESTER-I

PAPER –II (Inorganic Chemistry)

Learning Objectives:

- To acquire knowledge of quantum mechanics, shapes of orbitals and periodic properties.
- To gain knowledge of ionic bonding and ionic solids.
- To proper understanding of covalent bonding using VBT and MOT approach.

Course Outcome: After the end of the course, the students can understand:

- The atomic structure and periodic properties and trends; types of chemical bonding.
- Key knowledge of ionic bonding and different parameters of crystal structure.
- The basic knowledge of the VBT and MOT acquire with various examples.

(Total Credits: 2; Contact hrs: 30) **Marks: 50 (40+10)**

Unit I **(Contact hrs: 15)**

1. Atomic Structure and periodic properties **(Contact hrs: 07)**

1.1 Atomic Structure

a) What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 (Derivation not expected)

b) Quantum numbers

c) Shapes of s, p, d orbitals

d) Aufbau and Pauli's exclusion principle, Hund's rule of maximum multiplicity Stability of half-filled and completely filled orbitals, exchange energy

e) 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

1.3 Types of chemical bonding: Ionic, Covalent, Co-ordinate, Metallic, Hydrogen bonding and Weak Chemical Forces: van der Waal's forces, dipole-dipole interactions, induced dipole interactions, Instantaneous dipole-induced dipole interactions (Illustration with suitable examples and its implications).

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

2.1 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

2.2 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: unit cell, radius ratio, coordination number and stoichiometry.

Unit-II **(Contact hrs: 15)**

1. Covalent bonding: Valence Bond Theory (VBT) **(Contact hrs: 07)**

1.1 Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory: Merits and Demerits
1.2 Need of Hybridization with respect to $BeCl_2$, BF_3, $SiCl_4$
1.3 Types of hybridization and shapes of simple inorganic molecules: PCl_5,SF_6
1.4 Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O

2. Covalent bonding: Molecular Orbital Theory (MOT) **(Contact hrs: 08)**

2.1 Atomic and Molecular orbitals.
2.2 L.C.A.O. Principle
2.3 Bonding, Antibonding and Nonbonding Molecular orbitals.
2.4 Conditions for successful overlap
2.5 Different types of overlap (s-s, s-p_x, p_x - p_x and p_y- p_y or p_z- p_z)
2.6 Energy level sequence of molecular orbitals for n = 1 and n = 2
2.7 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

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SEMESTER-II
PAPER III: Organic Chemistry

(Total Credits: 2; Contact hrs: 30) **Marks: 50 (40+10)**

Learning Objectives:

- To study nature of bonding in organic molecules.
- To inculcate the detailed basics of reaction mechanism and various intermediates
- To study the different types of electronic effects.
- To understand the stereochemistry of organic compounds.
- To inculcate imagination and critical thinking of 3D structures of organic compounds.
- To study the unsaturated and alicyclic compounds.
- To study the concept of aromaticity, its applications and reactions.

Course Outcome: After the end of the course, student can:

- Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
- Able to predict the reactivity of organic molecules by the help of electronic effects.
- Understand the different reactions along with formation of intermediates.
- Able to think and predict the possible mechanism of various critical organic reactions.
- Able to imagine 3D structure of organic molecules.
- Easily comment on aromaticity of any organic compound and its stability
- Able to distinguish between saturated, unsaturated, alicyclic, aromatic and heterocyclic compounds.

Unit-I **(Contact hrs: 15)**

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

1.1 Introduction of reaction mechanism.

1.2 Types of arrow notations: Single headed curved arrow, Half headed curved arrow and double headed arrow.

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: Carbocations, Carbanions, Carbon free radicals, Carbenes, Nitrenes (Definition with suitable example, formation, structure, and relative stability)

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 w.r.t. phenol and nitrobenzene
2.4 Inductive effect, + I and –I
2.5 Strength of carboxylic acid w.r.t. inductive effect: Examples- a) Formic and acetic acid, b) monochloro, dichloro and trichloroacetic acid
2.6 Hyperconjugation w.r.t. toluene
2.7 Steric effect w.r.t. mesitoic acid

3. Stereochemistry of organic compounds **(Contact hrs: 05)**

3.1 Types of stereo-isomerism: Optical isomerism, Geometrical isomerism and Conformational isomerism
3.2 Optical activity
3.3 Essential conditions for Optical activity
a) Elements of symmetry
b) Chiral center w.r.t. lactic acid
3.4 Optical isomerism in lactic acid and tartaric acid
3.5 Enantiomers and diastereoisomers w.r.t. 2,3-dihydroxybutanoic acid
3.6 Racemic modification.
3.7 Geometrical isomerism: Introduction
3.8 Cause of geometrical isomerism.
3.9 Geometrical isomerism in maleic acid and fumaric acid.

Unit-II **(Contact hrs: 15)**

1. Cycloalkanes **(Contact hrs: 03)**

1.1 Cycloalkanes: Nomenclature, Methods of formation:
a) Internal Wurtz reaction
b) Distillation of calcium or barium salt of dicarboxylic acid
1.2 Chemical properties of cyclopropane
a) Free radical substitution of chlorine in presence of light.
b) Action of HBr and conc. H_2SO_4
c) Catalytic reduction by H_2/Ni
1.3 Industrial applications of cycloalkanes.

2. Alkenes, Dienes and Alkynes **(Contact hrs: 06)**

2.1 Nomenclature of alkenes.
2.2 Methods of formation of alkenes with mechanism
a) By dehydration of lower alcohols.

b) By dehydrohalogenation of lower alkyl halides.

2.3 Chemical reactions of alkenes: Hydrogenation, Electrophilic and free radical additions, Hydroboration, Oxidation, Epoxidation, Ozonolysis, Hydration, Hydroxylation, Oxidation with $KMnO_4$, Polymerization of alkenes: ethylene and propylene

2.4 Nomenclature and classification of dienes.

2.5 Isolated, Conjugated and cumulated dienes.

2.6 Butadiene: Methods of formation, polymerisation, 1, 2- and 1,4- additions and Diel's-Alder reaction.

2.7 Alkynes: Nomenclature, Acidity of alkynes.

2.1 Electrophilic and Nucleophilic addition reactions, Hydroboration, Oxidation.

2.9 Industrial applications of ethylene, 1,3-butadiene and acetylene.

3. Aromaticity and Benzene (Contact hrs: 06)

3.1 Aromatic, non-aromatic, antiaromatic and pseudo aromatic compounds.

3.2 Kekule structure of benzene

3.3 Resonance structures of benzene.

3.4 Molecular orbital picture of benzene.

3.5 Representation of benzene ring.

3.6 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.

37 Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenations 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 III. 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) Textbook of Organic Chemistry: P. L. Sony

11) Practical Organic Chemistry: 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

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SEMESTER-II
PAPER IV: Analytical Chemistry

(Total Credits: 2; Contact hrs: 30) **Marks: 50 (40+10)**

Learning Objectives:

1. To study the different types elements present in the organic compounds
2 To understand the qualitative analysis methods of C, H, N, S and halogen
3. To study the basic principle and classification of chromatography.
4. To study the paper chromatography and its applications.

Course Outcomes: After the end of the course, student can:

1. Understand the basic elements present in the organic compounds
2. Able to understand the qualitative analysis methods of C, H, N, S and halogen
3. Easily understand the basic principle and classification of chromatography
4. Able to know paper chromatography and its applications.

Unit-I **(Contact hrs: 15)**

1. Fundamentals of Analytical Chemistry (Contact hrs: 05)

1.1 Basic principle of titrimetric analysis and classification
1.2 Preparation and dilution of reagents/solutions.
1.3 Normality, Molarity and Mole fraction, Weight by weight (w/w), Weight by volume (w/v). Use of $N_1V_1 = N_2V_2$ formula
1.4 Preparation of ppm level solutions from source materials (salts), conversion factors, density and specific gravity of solutions, problems are expected.

2. Physical properties of liquids (Contact hrs: 10)

2.1 Introduction, additive and constitutive properties
2.2 Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer
2.3 Surface tension:- Determination of surface tension by Drop –Weight method
2.4 Parachor: Macleod equation and its modification by Sugden, applications of parachor in the determination of molecular structures as benzene and NO_2 group
2.5 Dipole moment, electrical polarization of molecules
2.6 Use of dipole moment in the study of molecular structure
2.7 Refractive index, Snell's law
2.8 Specific and molecular refractivity, Abbe's refractometer: Critical angle Principle, construction, working and advantages
2.9 Molecular refractivity and chemical constitution

Unit-II **(Contact hrs: 15)**

1. Qualitative and Quantitative Analysis (Contact hrs: 06)

1.1 Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur

1.2 Quantitative analysis of-

a) Carbon and hydrogen by Combustion method

b) Nitrogen by Kjeldahl's method

c) Halogen and Sulphur by Carius method.

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

1.4 Empirical formula and molecular formula determination.

1.5 Numerical Problems

2. Chromatography (Contact hrs: 04)

2.1 Introduction and General principle of Chromatography

2.2 Classification of Chromatography based on nature of stationary and mobile phase.

2.3 Paper Chromatography: Principle, Experimental procedure and applications

3. Analysis of food products (Contact hrs: 05)

3.1 Nutritional value of foods, idea about food processing and food preservation and adulteration.

3.2 Identification of adulterants in some common food items like milk, coffee powder, chilli powder, turmeric powder, coriander powder, pulses.

REFERENCE BOOKS

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. Stocchi, E. Industrial Chemistry, Vol-I, Ellis Horwood Ltd. UK (1990).
4. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
5. Skoog, D.A. Holler F.J. & Nieman, T.A. Principles of Instrumental Analysis,
6. Harris, D. C. Quantitative Chemical Analysis, W. H. Freeman.
7. Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.
8. Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India
12. G D Christian -Analytical Chemistry
13. Qualitative Organic Analysis 4th Edn by A I Vogel (ELBS)
14. Vogel's Quantitative Analysis
15. Douglas A Skoog, Donald M West, F James Holler ,Stainly R Crounch , Fundamentals of Analytical Chemistry, 9th edition
16. David Harvey, Modern Analytical Chemistry, McGraw Hill Higher education
17. Gurudeep R Chatwal, Sham K Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
18. Barrow, G.M. Physical Chemistry Tata McGraw Hill (2007).

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SEMESTER-I & II
Chemistry Practical - I

(Total Credits: 4, Contact hrs: 4 hrs per week) **Marks: 100 (80+20)**

N.B. i) Use of Digital balance is allowed.
ii) Use S.I. Units Wherever Necessary.
iii) Any 20 practicals out of total are mandatory.

A) Physical Chemistry

1) Determination of equivalent weight of Mg by Eudiometer.
2) Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.
3) Study of specific reaction rate of hydrolysis of methyl acetate in presence of H_2SO_4
4) Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)
5) Determination of heat of ionization of weak acid.

B) Inorganic Chemistry

1) Inorganic Quantitative Analysis: Volumetric Analysis

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

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

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

2) Inorganic preparation:

i) Preparation of ferrous ammonium sulphate
ii) Preparation of sodium cuprous thiosulphate

C) Organic Chemistry

1) Organic Qualitative Analysis.

Identification of at least **six** organic compounds with reactions including at least one from acids, phenols, bases and 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) Comparison with literature
6) Confirmatory Test
7) Summary
8) Result

2) Organic Preparation:

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.)

D) Analytical 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 refractive index and specific refraction of given liquids. [Any two liquids from, CCl_4, $CHCl_3$, benzene, xylene, toluene, ethyl alcohol]

3) Estimations : (any two)

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

4) Qualitative Analysis:

i) 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+}.

ii) 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) 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. Jahagirdar
8) Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)

9)Vogel's Text Book of Qualitative Chemical Analysis (Longman ELBS Edition)
10)Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar
11)Hand book of Organic Qualitative Analysis : Clarke
12) Comprehensive Practical Organic Chemistry - Quantitative Analysis by V.K. Ahluwalia,Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
13) Comprehensive Practical Organic Chemistry preperation and Quantitative Analysis. : V.K. Ahluwalia, Renu Agarwal, University Press. Distributor - Orient Longman Ltd.,
14)A laboratory Hand-Book of organic Qualitative Analysis and separation :V. S. Kulkarni,Dastane Ramchandra and Co. Pune.

Note:

1. Minimum 20-22 experiments from four sections should be completed during academic year.

2. Experiments from all the four sections should be covered.

- **University Examination:** University examination will be conducted by as per the guidelines issued by the PAH Solpaur University, Solapur.

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**
6.

Practical paper has 80 marks for university practical examination. Duration ofpractical examination is one day. There will be TWO practicals, (P+I/I+O/O+A/A+P). Out of 80 marks for university practical examination, the mark distribution is as follows.

Q. 1 Any Two: (30+30)=60 Marks

A) Physical Chemistry experiment :
B) Inorganic Chemistry experiment :
C) Organic Chemistry experiment :
D) Analytical Chemistry Experiments :

Q. 2 Oral : 10 marks
Q. 3 Journal : 10 marks

Total Marks : 80 marks

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: 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 422^0K. 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

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

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 ψ and ψ^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 ΔG, ΔH andΔS.
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

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_2tolungs

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^+andK^+

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^2reaction)

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).

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 andSO_3
ii) Oxides of Phosphorous : P_4O_6 andP_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 andCCl_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.

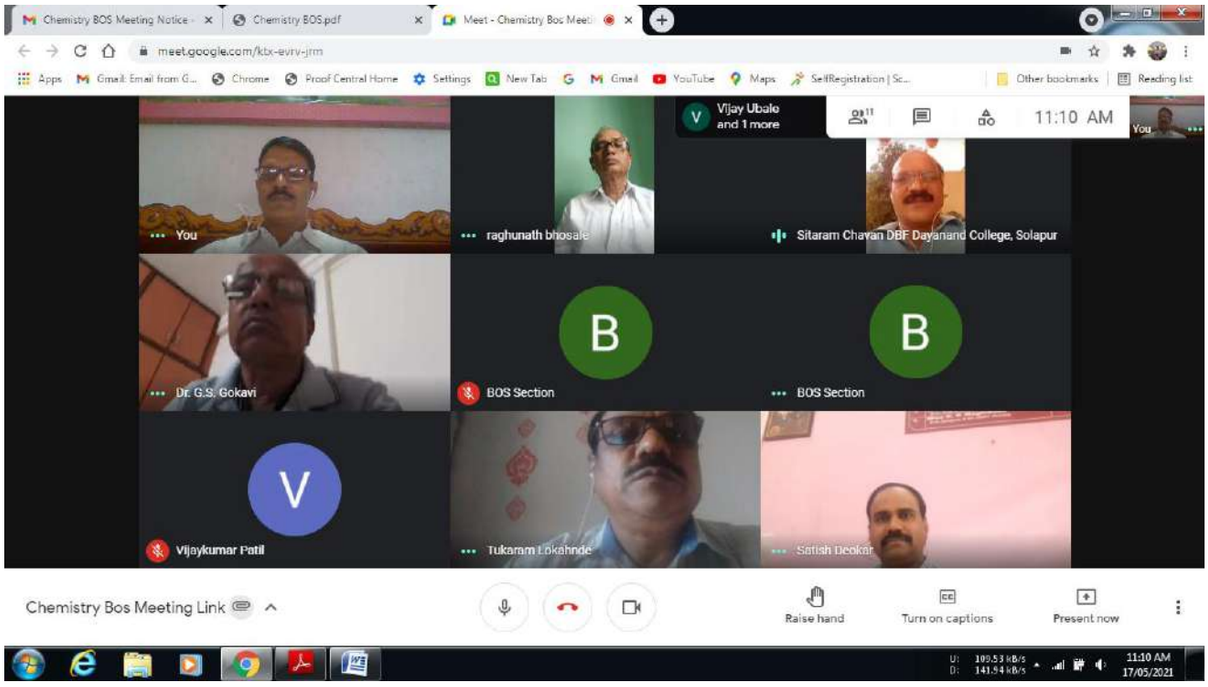
2. Hand book of Organic qualitative analysis by H. T.Clarke.

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.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022

'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: MICROBIOLOGY

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

(Syllabus to be implemented from June 2022)

Choice Based Credit System (CBCS)
(W.e.f. June 2022)

Preamble:

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.

Introduction:

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, medical microbiology, microbial biochemistry, virology and 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.

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

3. **Ability Enhancement Compulsory Course (AECC***):* 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) English and (ii) English/ Democracy, Elections and Good Governance. 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 10 marks and University Evaluation for 40 marks for each paper in semester I and II.

• 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- I Microbiology shall consist of two semesters: Semester I and Semester II

In semester I: there will be two DSC papers having paper I to II of 50 marks each. English will be Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" .

In Semester II: there will be two DSC papers having paper III to paper IV of 50 marks each. There will two Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" as a English with Democracy, Elections and Good governance

• **Scheme of Evaluation:**

As per the norms of the grading system of evaluation, for each paper 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: (Paper I & II=50+50=100 marks): Comprising DSC

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

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper I and paper II) by conducting unit test/ open book test/ home assignment/ Group discussion.

c) Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English

Semester – II: Theory: (100 marks): Comprising DSC

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

b) Internal Continuous Assessment (CA) (20 marks) No. of theory papers: 2 (paper I and paper II) by conducting unit test/ open book test/ home assignment/ Group discussion.

c) Compulsory paper on "Ability Enhancement Compulsory Course (AECC)" on English and Democracy, Elections and good governance.

Practical Examination: (100 marks)

University Examination (80 marks): Number of questions on practicals for exam: 07

Practical-I: Based on Papers- I & II, III & IV (80 Marks UA)

Internal Continuous Assessment: (20 Marks CA)

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

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Fundamentals of Microbiology	**Introduction to Microbiology and Microbial Diversity**
2)	Basic Techniques in Microbiology	**Cell cytology and Microbial Techniques**
3)	Microbial Physiology	**Microbial Metabolism and Cultivation**
4)	Applied Microbiology	Applied Microbiology

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Choice Based Credit System (CBCS),

(w.e.f.2022-23) Revised 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 Compulsory Course (AECC)		English Paper I Part-A (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		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**	--	--	**450**	**360**	**90**	**18**
Class :	**B.Sc.- I Semester – II**									
Ability Enhancement Course(AECC)		English Paper I Part-B (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		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			50	40	10	NC
Total (Theory)				**24**	--	--	**450**	**360**	**90**	**18**
Core Practical		DSC 1 A & 1B	Practical I	--	--	4	100	80	20	4.0
		DSC 2 A & 2B	Practical I	--	--	4	100	80	20	4.0
		DSC 3A & 3B	Practical I	--	--	4	100	80	20	4.0
		DSC 4A & 4B	Practical I	--	--	4	100	80	20	4.0
Total (Pract.)						**16**	**400**	**320**	**80**	**16**
Grand Total				**48**		**16**	**1300**	**1040**	**260**	**52**

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS)(w.e.f.2023-24)

Revised 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
	Name			L	T	P				
Class :	**B.Sc.- II Semester – III**									
Core Courses (*Students can opt any Three subjects among the Four Subjects offered at B. Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B. Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1C	AIC-1A	Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 2C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 3C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
Total Sem.-III				**18**	--	--	**300**	**240**	**60**	**12**
	$ SEC-1			4	--	--	100	80	20	4
Class :	**B.Sc.- II Semester –IV**									
Core Courses (*Students can opt any Three subjects among the Four Subjects offered at B.Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1D	AIC-1B	Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 2D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 3D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	Environmental Studies			**3**	--	--	**50**	**40**	**10**	**NC**
Total Sem-IV				**18**			**300**	**240**	**60**	**12**
Total (Theory)				**36**	--	--	**600**	**480**	**120**	**24**
Core Practical	DSC 1C & 1D	AIC 1A & 1B	Pr. II &III	--	--	8	200	160	40	4.0
	DSC 2C & 2D		Pr. II & III	--	--	8	200	160	40	4.0
	DSC 3C & 3D		Pr. II & III	--	--	8	200	160	40	4.0
Total (Practicals)						**24**	**600**	**480**	**120**	**24**
Grand Total				**36**		**24**	**1200**	**960**	**240**	**48**
	$ SEC-1			**4**			**100**	**80**	**20**	**4**

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

Additional Interdisciplinary Courses - Geochemistry/Biochemistry/Meteorology/Plant Protection/NCC etc. $The students can choose MOOCs/ NPTEL/SWAYAM/Path Shala/Add-on / Skill based courses of university/college initiated courses of same credits.

$ These courses are not compulsory, but after completion of these courses students get additional credits on their mark lists.

$ SEC courses run by colleges should be communicated to university for information & necessary action.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS)(w.e.f.2024-25)

Revised 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 II Part A	4	--	--	50	40	10	2.0
Core Courses: (Students can opt any one subjects among the three Subjects excluding Interdisciplinary/Additional subject offered at B. Sc-II.)		DSC 1 E	Paper IX	4	--	--	100	80	20	4.0
		DSC 1 F	Paper X	4	--	--	100	80	20	4.0
		DSC 1 G	Paper XI	4	--	--	100	80	20	4.0
		DSE 1 A/B/C	Paper XII	4	--	--	100	80	20	4.0
Total Theory Sem-V				**20**	**--**	**--**	**450**	**360**	**90**	**18**
	$ SEC-2			4	--	--	100	80	20	4.0
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)		English (Business English)	Paper II Part B	4	--	--	50	40	10	2.0
Core Coursest: (Students can opt any one subjects among the three Subjects excluding interdisciplinary / Additional subject offered at B.Sc. II.		DSC 1 H	Paper XIII	4	--	--	100	80	20	4.0
		DSC 1 I	Paper XIV	4	--	--	100	80	20	4.0
		DSC 1 J	Paper XV	4	--	--	100	80	20	4.0
		DSE 2 A/B/C	Paper XVI	4	--	--	100	80	20	4.0
Total Theory Sem-VI				**20**	**--**	**--**	**450**	**360**	**90**	**18**
Core		DSC 1E &1H	Practical IV	--	--	5	100	80	20	4.0
		DSC 1F & 1 I	Practical V	--	--	5	100	80	20	4.0
		DSC 1G & 1 J	Practical VI	--	--	5	100	80	20	4.0
		DSE 1A/B & 2 A/B	Practical VII	--	--	5	100	80	20	4.0
Total (Practicals)						**20**	**400**	**320**	**80**	**16**
Grand Total				**40**		**20**	**1300**	**1040**	**260**	**52**
	$ SEC- 2			**4**			**100**	**80**	**20**	**4**

$The students can choose MOOCs/ NPTEL/SWAYAM/Pathshala/Add-on / Skill based courses of university/college initiated courses of same credits.

$ These courses are not compulsory, but after completion of these courses students get additional credits on their Mark lists. $SEC Courses initiated by colleges should be communicated to university for information and necessary action.

Summary of the Structure of B.Sc. Program as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-I	I	450	18	--	--	18
	II	450	18	400	16	34
B.Sc.-II	III	300	12	--	--	12
	IV	300	12	600	24	36
B.Sc.-III	V	450	18	--	--	18
	VI	450	18	400	16	34
Total		2400	96	1400	56	152
	SEC sem.- III & V	200	8			8

B.Sc. Programme :

Total Marks : Theory + Practicals = 2400(+200) +1400 =3800+200

Credits : Theory + Practicals = 96(08) + 56 = 152+08

Numbers of Papers Theory: Ability Enhancement Compulsory Course (AECC) 04

Theory: Discipline Specific Core Paper (DSC) 20

Theory: Discipline Specific Elective paper (DSE) 02

Skill Enhancement Course (SEC) 04

Total : Theory Papers (Core paper-22) 30

: Practical Papers 11

Abbreviations:

L: Lectures T: Tutorials P: Practical UA : University Assessment CA : College Assessment CC: Core Course AEC : Ability Enhancement Course DSE : Discipline Specific Elective Paper SEC : Skill Enhancement Course, AIC: Additional Interdisciplinary Courses

Note:

Each theory papers of 50 Marks should be of two Units.

Each theory papers of 100 Marks should be of four Units.

Each theory paper Unit is of 15 Lectures.

Practical paper of 100 Marks is of at least 20 practical.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. I (Semester I)

DSE 4A: Paper I – Introduction to Microbiology and Microbial Diversity		
THEORY COURSE (02 credits) **Total Lectures 30L**		
Unit No.	**Content of Unit**	**Lectures Allotted**
I	**History and Scope of Microbiology** A. **Historical Background:** a) Contribution of Robert Hook, Antony Van Leuwenhoek, Ernst Ruska b) Theory of spontaneous generation: Francisco Redii, John Needham, Friedrich Schroder and Van Dusch, Louis Pasteur (Swan neck flask experiment) and John Tyndall. c) Golden era of Microbiology (1857-1914) - i) Germ theory of fermentation ii) Germ theory of disease d) Contribution of Martinus Beijerinck, Sergei Winogradsky, Joseph Lister and Dmitri Ivanovski, Edward Jenner, Eli Metchnikoff, Salman Waksman, Alexander Fleming. in development of applied microbiology. B. **a) Branches of Microbiology** **b) National Institutes related to microbiology in India –** NIV, NARI, NCCS, CCMB, Serum Institute of India, Vasantdada Sugar Institute.	**15**
II	**Microbial Diversity** **A. General Characteristics, occurrence and economic importance of microorganisms –** a) Acellular – Viruses (definition and example of Phytophage, Zoophage and Bacteriophage), Viroid, Prions b) Cellular – i) Bacteria (Size, Shape and Arrangement) ii) Mycoplasma iii) Rickettsia iv) Actinomycetes v) Archaebacteria vi) Algae vii) Fungi viii) Protozoa **B. Differences between prokaryotic and eukaryotic cell** C. **Bacterial Taxonomy** - a) Basic principles of nomenclature b) Criteria for bacterial classification and identification – Morphological, cultural, Biochemical and molecular by 16S rRNA gene sequencing, % G + C (Introductory concept),	**15 L**

DSC4A: Paper II: Cell cytology and Microbial Techniques		
THEORY COURSE (02 credits) **Total Lectures 30L**		
Unit No.	**Content of Unit**	**Lectures Allotted**
I	**Cellular organization of Bacteria** **A) Structure, composition and Functions of :** i) Cell wall-Gram-positive and Gram-negative bacteria ii) Definitions of sphaeroplast and protoplast iii) Cell membrane -fluid mosaic model iv) Cytoplasm- Ribosome, mesosome and nucleoid v) Ultrastructure of endospore vi) Capsule and slime layer vii) Flagella and Pili	**15**
II	**Basic techniques in Microbiology** **A) Microscopy** i) Basic concept-Magnification, numerical aperture and resolving power. ii) Principle, working and application of compound microscope and electron microscope (Scanning electron microscope (SEM), Transmission electron microscope (TEM). B) Staining techniques – i) Definition, types of stain ii) Different methods of staining- monochrome, negative, Differential, iii) Special staining - Cell wall staining (by Chance's method) and capsule staining (by Maneval's method) C) Sterilization techniques: i) Definitions of- sterilization, disinfection, antiseptic, germicide, microbiostasis and sanitization ii) Sterilization by Physical agents-Temperature (dry heat and moist heat), Radiation -U.V rays and γ-rays and Membrane Filtration. **iii) Sterilization by chemical agents** Phenol and phenolic compounds , Ethyl alcohol, Halogens- chlorine and iodide, Heavy Metals – Copper and Mercury and Gaseous agents- Ethylene oxide, β- propiolactone, formaldehyde.	**15 L**

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. I (Semester II)

DSC 4B: Paper III: Microbial Metabolism and Cultivation		
THEORY COURSE (02 credits) Total Lectures 30L		
Unit No.	**Content of Unit**	**Lectures Allotted**
I	**Biomolecules and Bioenergetics:** **A) Biomolecules: Structure and function of** a) Carbohydrates b) Proteins c) Lipids d) Nucleic acids- i) DNA ii) RNA **B) Bioenergetics:** First and Second law of Thermodynamics, Definition of Gibbs free energy, enthalpy and entropy, High energy compounds and structure of ATP, definition of Metabolism, Anabolism and Catabolism. **C) Enzymes and metabolic pathways:** i) Definition -apoenzyme, coenzymes, cofactors, prosthetic group and active site. ii) Types of enzymes - extracellular and intracellular, constitutive and induced enzyme. iii) Mechanism of enzyme action: Lock and key hypothesis and induced fit hypothesis. **iv) Catabolism of glucose-** EMP pathway, Fate of Pyruvate- i) Aerobic ii) Anaerobic (Ethanol) iii) Microaerophilic (Lactic acid)	**15**
II	**Microbial Nutrition and Cultivation Technique** **A) Microbial Nutrition:** i) Nutritional requirements of microorganisms ii) Nutritional types of Microorganisms based on Carbon and Energy source. **B) Cultivation techniques of Microorganisms** **1) Culture Media:** i) Definitions with example- Living media and Non-living media- (Natural, Synthetic, Semi synthetic, Differential, Enriched and Selective). **2) Methods of Pure culture**: i) Serial dilution ii) Streak Plate, Spread Plate and Pour Plate technique.	**15 L**

DSC 4B: Paper IV: Applied Microbiology		
THEORY COURSE (02 credits) **Total Lectures 30L**		
Unit No.	**Content of Unit**	**Lectures Allotted**
I	**Water and sewage Microbiology** **A.** Water Microbiology: a) Sources of Microorganisms in water b) fecal pollution of water and its indicator c) routine bacteriological analysis of water for detection and differentiation of coliforms – i) qualitative (presumptive, confirmed and completed) and IMViC and Eijkman test ii) Quantitative Test – MPN d) Municipal water purification process: Sedimentation, Filtration and Disinfection B. Sewage Microbiology: a) Definition, Types and Microflora of sewage b) Definition of DO , BOD and COD, c) Treatment of Sewage – Primary (Physical), Secondary (Chemical) and Tertiary (Biological) method	**15**
II	**Medical Microbiology** A. Definitions:- Infection, etiology, etiological agents, disease, pathogen, incubation period, fomite, pathogenecity, virulence, morbidity rate, mortality rate, opportunistic pathogen, carriers, host, epidemiology, prophylaxis. B. Types of diseases:- Epidemic, endemic, pandemic & sporadic C. Types of infections: Primary, Secondary, acute, chronic, reinfection, cross infection, Mixed infection, congenital, local, systemic 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	**15 L**

Practical Course B.Sc. – I Microbiology

Marks: 80+20

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) PH Meter

f) Laminar Air flow

3. Handling and Care of compound Microscope

4. Monochrome staining

5. Negative staining

6. Gram staining

7. Special Staining Procedures - Cell Wall (Chance's Method)

8. Special staining Procedures - Capsule (Maneval's Method)

9. 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

10. Demonstration of inoculation techniques – Broth, Slant, Stab, Spot, Spread, Streak and Pour plate

11. Determination of CFU by Serial Dilution Technique using sewage / food / soil/ water sample

12. Study of colony characteristics of bacterial isolates.

13. study of bacterial motility by Hanging drop technique

14. Isolation and identification of *E.coli* by four quadrant method using MacConkeys Agar.

15. Isolation and identification of *Bacillus sp*. by four quadrant method using Nutrient Agar.

16. Mounting of Fungi (a) Aspergillus (b) Rhizopus (c) Penicillium (d) Mucor

17. Study of coliforms by IMViC test.

18. Study of sugar fermentation - Glucose, Lactose,

19. Detection of Amylase activity

20. Detection of Caseinase activity

List of the Minimum equipments and related requirements for B.Sc – I

1) Centrifuge (Desktop): One
2) Hot plate: One
3) Hot air oven: One
4) Bacteriological incubator: One
5) Compound Microscope: one for each student
6) Light Microscope: Two
7) Separate room for fine instruments of size 10’×15’ feet dimension
8) A separate culture room of at least 10’×10’ feet dimension
9) Laminar air flow cabinet: One
10) Distillation assembly: One (Glass)
11) Water bath: One
12) Colony counter: One
13) Refrigerator: One
14) Computer with Internet facilities and printer: One
15) Micropipette: One
16) pH meter
17) Digital weight balance
18) Autoclave

References:

1. Outline of Biochemistry – Cohn and Stump
2. Biochemistry – Lehninger
3. Enzymes – Dixon and Web
4. Text book of Medical Microbiology – Ananthnarayan
5. Review of Medical Microbiology – Jawetz et al
6. Microbiology – Zinsser
7. Medical Microbiology – Cruickshank
8. Medical Microbiology - Davis and Dulbecco
9. Medical Bacteriology – Dey and Dey
10. Biology of Microorganisms – Brock, Parker, Madigen, 9th edition
11. Microbiology – Prescott and Harley, 5th edition
12 General microbiology – Stanier
13. General microbiology – Pawar and DaginawalaVol I and II
14. Advances in Biotechnology – S.W. Jogdand.
15. Textbook of Biotechnology – R.C. Dubey,
16. Biotechnology – B.D. Singh
17. Fundamentals of Bacteriology by A.J. Salle
18. Textbook of Microbiology by Pelczar, Tata McGraw Hill Publication.

B.Sc. Part I Microbiology

Practical Question Paper pattern for University assessment (UA)

Total Marks: 100 (80+20) Marks

Q. 1. Isolation, Colony Characters, Gram Staining and Motility of Bacillus spp / E.coli 25

Or

Q.1 Determination of CFU by Serial Dilution Technique using sewage / food / soil/ water sample

Q.2 Staining 10

Cell wall/ Capsule.

Q.3. Mount and Identify given fungus 10

Q. 4 Biochemical Test 10

Indol/ Methyl Red/ Voges proskauer/ Citrate Utilization/

Q.5. Enzyme Activity 10

Amylase/ Caseinase/ Glucose / Lactose fermentation

Q. 6 Spotting 10

(A) Identify and give its Use (Microscope Part)

(B) Identify and give Significance of (laboratory instrument)

(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)

Q. 7. Journal 5

College Assessment (CA) practical question paper pattern Marks 20

Q.1 Isolation by studying colony characters/staining techniques 10

Q.2 Spotting 05

Q. 3 Viva, Journal, Attendance 05

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** 1. **Bacterial Cell wall**: chemical composition, structure and functions of cell wall of Gram Positive and Gram Negative bacteria **2. Cell Membrane**: Chemical Composition, structure and functions. Transport across cell membrane – simple diffusion, facilitated diffusion, active transport & group translocation. 3. **Mesosome** & its functions**.** 4. **Flagella**: Structure and functions , Mechanism of movement, Tactic behaviors 5. **Pili**: Types, Structure and functions 6. **Cytoplasmic inclusions**: Chlorobium vesicles. Gas vacuoles, Magnetosomes and carboxysomes and their functions 7. **Reserve Food Materials**: Nitrogenous and Non nitrogenous and their role 8. **Bacterial Endospore**: Ultra-structure and functions, sporulation as an example of cell differentiation, Germination of endospore	**15 L**
II	**Bacterial Growth** 1. Definitions of - growth, generation time, growth rate and Synchronous Growth 2. Growth phases 3. Measurement of growth – Cell numbers, Cell Mass and Cell activity	**07 L**
III	**Effect of Environmental factors on Bacterial growth** **1. Temperature** Psychrophiles, Mesophiles, Thermophiles, Thermodurics **2. pH-** Acidophiles, Basophiles and Neutrophiles **3. Oxygen-** Aerobic, Anaerobic, Facultative Anaerobic and Microaerophilic **4. Osmotic pressure-** Osmophilic(Halophilic) **5. Hydrostatic Pressure-** Barophiles **6. Surface Tension**	**10 L**
IV	**Bacterial Metabolism** 1. **Fates of Pyruvate** – a) Aerobic Tri-Carboxylic Acid Cycle b) Anaerobic – Ethanol Fermentation c) Microaerobic – Lactic Acid Fermentation 2. **Modes of ATP generation** – a. Substrate Level Phosphorylation, b. Oxidative Phosphorylation - Respiratory electron transport chain, components of ETC, aerobic and anaerobic respiration 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- • Griffith Experiment • Avery, Macleod and McCarty's experiment • Hershey and Chase experiment 2. Structure & forms or types of DNA- • Watson and Crick's model of DNA • A, B ,C and Z form of DNA 3.DNA replication- • Modes of replication (Conservative, semoconservative and Dispersive) • Messelson & Stahl's experimental proof of semoconservative replication • Enzymes involved in replication • Mechanism of DNA replication	12
Unit –II: Gene, Genetic code and Plasmid	1. Definitions and concepts of - • Gene • Genome • Genotype • Phenotype • Cistron, Recon & Muton • Split gene-concept of intron and exons 2. Genetic code- • Definition and properties of genetic code 3. Plasmid- • Definition of plasmid and episome • Properties of plasmid • Types of plasmid-F plasmid, R plasmid, Col plasmid, Ti plasmid, Linear plasmid and Yeast 2µ plasmid • Applications of plasmid	09
Unit-III: Bacterial Mutation & Repair	1.Mutations & Mutagenesis- • Definition of mutation • Mutagen- physical and chemical Mutagens 2. Types of mutation- • Base pair Substitution- Transition and Transversion • Missense mutation • Nonsense muataion • Neutral Mutation • Silent Mutation • Frame shift Mutation	12

	3. Types of mutation on the basis of molecular mechanism- • Spontaneous Mutation- Definition, Fluctuation Test, Replica plate technique • Definition and Mechanism of Induced Mutations caused by- • Physical Mutagen- U.V.rays • Chemical mutagens- 5-Bromouracil, 2-aminopurine, Hydroxylamine, Nitrous acid, alkylating agent and Acridine dyes. 4. DNA repair- • Photo reactivation • Dark repair Mechanism-Excision repair (Base and Nucleotide)	
Unit- IV Bacterial Recombination	1. Definition of recombination 2. Fate of exogenote 3.Types of recombination- • Transformation- experimental proof & mechanism of transformation, Definition of transfection • Conjugation- a)Discovery, experimental evidence (Leaderberg & Tautum's & Davis U Tube) b) Mechanism of conjugation- F+ X F-, HFr X F-, F'X F- • Transduction- a) Discovery & experimental proof (Zinder & Leaderberg) 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 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 b. Acquired immunity – definition, types- Active & passive	(12)
Unit II: Antigen & Antibody	1. Antigen a.definition,concept of hapten,antigenic determinant, b.Types of antigen c.factors affecting antigenicity 2. **Antibody** (immunoglobulin) **a. Historical perspective-**Immune sera and concept of immunoglobulin b. Basic structure of antibody (immunoglobulin) c. Classes of immunoglobulins, physicochemical & biological properties and functions of Immunoglobulins.	(12)
Unit III: Antigen – antibody reactions	1. Purposes of antigen antibody reactions 2. General features antigen antibody reactions 3. Measurement of antigen antibody reactions 4. Mechanism antigen antibody reactions 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** 1.Bacterial Infections- Enteric fever, Staphylococcl wound infections and Urinary tract infections 2.Fungal Infection-Candidiais 3.Viral Infection- Dengue fever **B. Clinical Microbiology** 1.Basic concepts 2.Collection, handling & transportation of specimen 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) 2. Fermentations: Basic Concept, Types –Surface Culture Submerged Culture. Batch, Continuous culture (Chemostat & Turbidostat) , Dual and Multiple fermentation. 3. Design of typical Fermenter / Bioreactor: Parts and their functions	**(10)**
UnitII: Fermentation Media	1. Media for industrial Fermentations 2. Media Components and Optimization 3. Use of Waste as a fermentation Media 4. Inoculum and Production media	**(12)**
Unit III: Screening, Inoculum Development and Scale up	1. Screening: Primary and Secondary 2. Strain Improvement 3. Preservation of industrially important microorganisms 4. Inoculum Development 5. Scale up of Fermentation	**(09)**
Unit IV: Specific Fermentations & Fermentation Product Recovery	**a) Specific Fermentations** **1.** Penicillin fermentation (*P.chrysogenium*) 2.Alcohol (*S.cerevisiae*) 3. SCP (*S.cerevisiae*) 4.Amylase (A.niger) **b) Fermentation Product Recovery** 1. Criteria for selection of recovery method 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

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)

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	--	--	50	40	10	2.0
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	4	--	--	100	80	20	4.0
		DSE- 2 A- Agricultural Microbiology	Paper -X	4	--	--	100	80	20	4.0
		DSE- 3 A- Immunology	Paper- XI	4	--	--	100	80	20	4.0
		DSE 4 A-: Industrial Microbiology	Paper- XII	4	--	--	100	80	20	4.0
		(Add-on-self learning)* MOOC/SWAYAM COURSE/INTERNSHIP		--	--	--	--	--	--	4.0
Grand Total				**20**	--	--	**450**	**360**	**90**	**22**
Class :	**B.Sc.- III Semester –VI**									
Ability Enhancement Course(AECC)		**English (Business English)**	Paper IV	4.0	--	--	50	40	10	2.0
DSE (Students can opt any one subjects among the three Subjects excluding interdisciplinary offered at B.Sc. II.		**DSE- 1B-** Microbial Genetics	Paper -XIII	4.0	--	--	100	80	20	4.0
		DSE- 2B- Microbial Biochemistry	Paper- XIV	4.0	--	--	100	80	20	4.0

	DSE- 3B- Clinical Microbiology	Paper- XV	4.0	--	--	100	80	20	4.0
	DSE 4B- Environmental Microbiology	Paper- XVI	4.0	--	--	100	80	20	4.0
	SEC-								
Total (Theory)			**20**	--	--	**450**	**360**	**90**	**18**
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			**40**		**20**	**1300**	**1140**	**160**	**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	450	22	--	--	22
	VI	450	18	400	16	34
Total		2650	108	1100	44	152

B.Sc.Programme :

Total Marks : Theory + Practical's = 2650 +1100 =3850

Credits : Theory + Practical's = 108 + 44 = 152

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-IIl 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/college level add on course

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

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 Faculty of Science and technology 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	-	-	50	40	10	2
DSE-IX	**DSE- 1A-** Virology	4	-	-	100	80	20	4
DSE-X	**DSE- 2A-** Agricultural Microbiology	4	-	-	100	80	20	4
DSE-XI	**DSE- 3A-** Immunology	4	-	-	100	80	20	4
DSE-XII	**DSE 4A-** Industrial Microbiology	4	-	-	100	80	20	4
SEC-	**Add-on-self learning - MOOC/SWAYAM COURSE/INTERNSHIP**	--	--	--	--	--	--	4
Total		20	-	-	450	360	90	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	-	-	50	40	10	2
DSE- -XIII	**DSE- 1B-** Microbial Genetics	4	-	-	100	80	20	4
DSE-XIV	**DSE- 2B-** Environmental Microbiology	4	-	-	100	80	20	4
DSE-XV	**DSE- 3B-** Clinical microbiology Microbiology	4	-	-	100	80	20	4
DSE-A	**DSE 4B-** Microbial Biochemistry	4	-	-	100	80	20	4
SEC-								
Total		20			450	360	90	18

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

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[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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[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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[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.

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[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

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[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/

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[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

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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

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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

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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-2022
'B^{++}' Grade (CGPA 2.96)

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 June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. (Computer Science) - I year

Syllabus (Semester – I and II)

(Choice Based Credit System)

With Effect from June 2022

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

BCA (Bachelor of Computer Application)

Preamble :

The aim of the BSc Computer Science Syllabus has always consider the theoretical and practical knowledge of software and hardware techniques. The objective of the course is to prepare students to undertake careers involving problem solving using computer science and technologies, or to pursue advanced studies and research in computer science. With this strong foundation of computer science, the computer science students are expected to contribute efficient and effective solutions for the various problems that are given to them. With the advancement in software industry and technological innovations, the industry demands from graduate and postgraduate students are changing. We try to designed the syllabus which consider the industry expectations, to inspire the students to take-up higher education as well as research, to attract student over other courses and finally to fulfill the expectations of Credit system. The syllabus for these three years will be designed keeping these challenges in mind. The syllabus aims to cover core concepts of Computer Science and also to cover the latest technologies which can be accommodated at BSc level. One such step is that we would like to promote Open Source Technologies as much as possible. With so much of knowledge available on Internet, it is also the responsibility of teachers to make use of them in teaching, go beyond the books and make necessary changes in the approach and the contents. Students during these three years are expected to accumulate maximum knowledge and skills through this syllabus. In this year students acquires basic knowledge of computer technology and computer programming.

Objective of the Programme :

1. To develop problem solving abilities using a computer.
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
3. To train students in professional skills related to Software Industry.
4. To prepare necessary knowledge base for research and development in Computer Science.
5. To help students build-up a successful career in Computer Science and to produce entrepreneurs who can in-novate and develop software products.
6. To help students for starting their own software industry.

Programme Outcome:-

1. Develop ability to analyze a problem, identify and define the computing requirements, which may be appropriate to its solution.
2. To prepare students to undertake careers involving problem solving using computer science and technologies.
3. Develop ability to pursue advanced studies and research in computer science.
4. To produce entrepreneurs who can innovate and develop software product
5. Depending on the chosen pathway, you can focus on particular areas of interest such as machine learning, web development, data science and video games.
6. The study program is designed to prepare students for a wide variety of careers. The most profound positions that our graduates are well prepared to occupy (or have already been engaged in) may be classified into the following professional disciplines: Software Engineering, Systems Design, and Programming, Applications design and programming and Information-Systems design and analysis.
7. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
8. Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
9. Development of in-house applications in terms of projects

Eligibility for B. Sc.

The candidate passing the Higher Secondary Examination Conducted by the Maharashtra State Board of Higher Secondary Education with Science stream or its equivalent examination.

Medium of Instruction: English

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Choice Based Credit System (CBCS), (w.e.f.2022-23)

Revised 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 Compulsory Course (AECC)		English Paper I Part-A (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		DSC 1A	Fundamentals of Computers	2.5	--	--	50	40	10	4.0
			Programming Using C	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**	--	--	**450**	**360**	**90**	**18**
Class :	**B.Sc.- I Semester – II**									
Ability Enhancement Course(AECC)		English Paper I Part-B (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		DSC 1B	Introduction to Web Designing	2.5	--	--	50	40	10	4.0
			Operating System	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			50	40	10	NC
Total (Theory)				**24**	--	--	**450**	**360**	**90**	**18**
Core Practical		DSC 1 A & 1B	Practical I	--	--	4	100	80	20	4.0
		DSC 2 A & 2B	Practical I	--	--	4	100	80	20	4.0
		DSC 3A & 3B	Practical I	--	--	4	100	80	20	4.0
		DSC 4A & 4B	Practical I	--	--	4	100	80	20	4.0
Total (Pract.)						**16**	**400**	**320**	**80**	**16**
Grand Total				**48**		**16**	**1300**	**1040**	**260**	**52**

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

Summary of the Structure of B.Sc. Program as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-I	I	450	18	--	--	18
	II	450	18	400	16	34
B.Sc.-II	III	300	12	--	--	12
	IV	300	12	600	24	36
B.Sc.-III	V	450	18	--	--	18
	VI	450	18	400	16	34
Total		2400	96	1400	56	152
	SEC sem.- III & V	200	8			8

B.Sc. Programme :

Total Marks : Theory + Practicals = 2400(+200) +1400 =3800+200

Credits : Theory + Practicals = 96(08) + 56 = 152+08

Numbers of Papers Theory: Ability Enhancement Compulsory Course (AECC) 04

Theory: Discipline Specific Core Paper (DSC) 20

Theory: Discipline Specific Elective paper (DSE) 02

Skill Enhancement Course (SEC) 04

Total : Theory Papers (Core paper-22) 30

: Practical Papers 11

Abbreviations:

L: Lectures T: Tutorials P: Practical UA : University Assessment CA : College Assessment CC: Core Course AEC : Ability Enhancement Course DSE : Discipline Specific Elective Paper SEC : Skill Enhancement Course, AIC: Additional Interdisciplinary Courses

Note: Each theory papers of 50 Marks should be of two Units.

Each theory papers of 100 Marks should be of four Units.

Each theory paper Unit is of 15 Lectures.

Practical paper of 100 Marks is of at least 20 practical.

Paper-I: - Fundamentals of Computers
[Credits: Theory-(2.5), Practicals-(2)]

Total Theory Lectures-30

Course Objectives –

1. The objective of this course is to make the learner ready to understand basic of computer.
2. To learn different types of languages used in Computer system
3. To Learn basic steps to solve programs
4. Learner are ready to create document, create presentations and do some calculations.
5. Learner are ready to create attractive certificates.

Unit I:-Introduction to Computer (10)

Introduction to computers, Evolution of personal computers; Generation of computers; type of computers, Elements of a computer processing system- Hardware & Software, various categories of software;

Computer organization Overview-

Block diagram of CPU, various types of I/O devices, primary and secondary storage devices and media; various type of displays and other peripherals used in PCs.

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

Algorithm, Flowcharts, Pseudo code

Unit II:- Office Automation (20)

Word:-Introduction to MS Word, opening, creating, saving, deleting document, page setting, formatting page, formatting text, adding images, Header footers, border and shading, bullets, mail merge, Table, graphics, label, Templates, Wizards and Printing Techniques.

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

PowerPoint: Introduction and Applications of Power Point, create a New Presentation, Adding Slides, Clip Arts, Smart art, Charts, Text, images and other objects, Templates and Master Slides, Giving Animation effects, Links and Action buttons, creating certificate

Course Outcomes-

1) Apply knowledge of computer to identify types of computer system and ready to understand basic of computer.
2) Learner are now understands different types of computer languages
3) Learner can understand steps to solve programs
4) Learner can understand to create office documents, create presentations and create worksheet.
5) Learner are able to create attractive certificates design.

Reference Books-

1. Computer Fundamentals : Concepts, Systems & Applications- 8th Edition-BPB Publication-by Priti Sinha, Pradeep K., Sinha
2. Fundamentals Of Computers-6th Edition- Eastern Economy Edition Books - PHI Learning- By V. Rajaraman, Neeharika Adabala
3. Computer Fundamentals- Pearson- 1st Edition- By Anita Goal
4. Fundamentals of Information Technology – Kalyani Publishers; 3rd edition- by Srivastava Chetan
5. Computer Fundamentals: Architecture and Organization-4th Edition- New Age International Pvt. Ltd., Publishers-By B. Ram
6. MS-Office Paperback – First edition- Laxmi Publications-by S.S. Shrivastava

Paper-II: - Programming Using C

[Credits: Theory-(2.5), Practicals-(2)]

Total Theory Lectures-30

Course Objectives –

1. To understand structured programming approach using C.
2. To develop the basic concepts and terminology of programming in C.
3. To implement algorithms in the 'C' language.
4. To test, debug and execute programs.

Unit I:-Introduction to 'C' (15)

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

Arrays and String-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.

Unit II: -Function, Structure and File (15)

Function and Pointer- Definition, declaration, function prototypes, Local and global variables, User defined functions, recursion, passing array and string to function, Storage classes

Pointers-Definition and declaration, Pointer and array, Call by value and Call by reference,

Structures and Union-Definition and declaration, Array of structures, passing structure to function, Pointer to structure, Nested structure, self-referential structure, Size of and typedef, Definition and declaration of union, difference between structure, union and array.

File Handling-Defining, opening and closing of file, operations on file, Standard input and output functions, formatted input and output functions, file opening modes, Random access of file, command line argument.

Course Outcomes-

1. Explore programming language.
2. Develop modular programs using control structures and arrays in 'C'.
3. Develop user define data type like structure and union.
4. Learner are write programs for file handling in 'C'.

Reference Books-

1. Let Us C -18th Edition- BPB Publications-by Yashavant Kanetkar
2. C Programming Language- Pearson- 2nd Edition- Dennis Ritchie
3. Programming in C- Oxford University Press- - 2nd Edition -by Ghosh Manas and Pradip Dey
4. Programming In Ansi C- 8th Edition-Tata McGraw-Hill -By Balagurusamy

Paper-III: - Introduction to Web Designing

[Credits: Theory-(2.5), Practicals-(2)]

Total Theory Lectures-30

Course Objectives-

1. Understand the principles of creating an effective web page.
2. Learn the language of the web: HTML and CSS.
3. Learn web form
4. Learn form validation
5. Develop basic programming skills using Javascript.

Unit I:- Introduction to HTML, HTML5 and CSS (15)

HTML:-Introduction to HTML, Overview of basic HTML , Structure of HTML, Creating and opening HTML file, Singular and paired tags, Text formatting tag, Anchor tag, Lists, Image, Image Map, Table, Frames and Frameset, HTML Form

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

Introduction to CSS:- 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, Backgrounds and Borders Image, Values and Replaced Content, Text Effects,2D/3D, Transformations, Animations, Multiple Column Layout, User Interface, CSS interact with JavaScript.

Unit II:- JavaScript (15)

Introduction to JavaScript, JavaScript Variables & Data types, Operators, Built in functions 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.

Course Outcomes-

1. Student can able to design simple and attractive web pages.
2. Student can understand HTML, HTML5 and CSS and using these technique students will develop interactive web pages.
3. Students can able to design web form and form validation
4. Student can understand JavaScript language for client side development.

Reference Books:-

1. HTML 5 Black Book: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery- Dreamtech Press- 2nd Edition- by Kogent Learning Solutions Inc.
2. Beginning JavaScript and CSS Development with JQuery-Wrox Press-by Richard York
3. Beginning HTML and CSS Paperback – John Wiley & Sons - illustrated Edition- by Rob Larsen
4. HTML & CSS: The Complete Reference- McGraw-Hill Digital-Fifth Edition- By Thomas Powell.

Paper IV:-Operating System

[Credits: Theory-(2.5), Practicals-(2)]

Total Theory Lectures-30

Course Objectives-

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 virtualmemory.
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 (15)

Definition Operating systems, Types of Operating Systems-Batch, Multiprogramming, Time Sharing, Real-Time, Distributed, Parallel., OS Service, System components, System Calls

Process Management: - Concept of Process, Process states, Process Control Block, Context switching, Operations on Process, Threads – Types of threads, Benefits of threads.

Concept of Process Scheduling- Types of Schedulers, Scheduling criteria, Scheduling algorithms Preemptive and Non-preemptive , 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, and Classical Problems of Synchronization: Reader-Writer Problem, Dinning Philosopher Problem.

Deadlock-Concept of deadlock, Dead Lock Characterization, Resource Allocation Graph, Methods of deadlock Handling- Deadlock Prevention, Deadlock Avoidance -banker's algorithm, Deadlock detection and Recovery.

Unit 2: Memory Management (15)

Memory Management: - Logical and Physical address Space, Dynamic Loading, Overlays, Swapping,

Memory allocation: Contiguous Memory allocation – Fixed and variable partition – Internal andExternal 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.

Disk Management: disk scheduling (FCFS, SSTF, SCAN, C-SCAN).

Course Outcomes-

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 operatingsystem
4) Describe and analyze the memory management and its allocation policies.
5) Identify use and evaluate the storage management policies with respect to different storagemanagement technologies.

Reference Books:

1. Systems Programming and Operating Systems- McGraw Hill Education India Pvt Ltd-2nd edition -by Dhananjay M. Dhamdhere.
2. Modern Operating Systems- Pearson-4th Edition-By by Andrew Tanenbaum
3. Operating System Concepts- John Wiley & Sons Inc- 9th edition- By Siberchatz and Galvin.

Practical on Paper-I: - Fundamentals of Computers

1. Demonstration of peripherals
2. DOS – external and internal commands, batch files commands
3. Windows Operating System – Windows explorer, program manager, control panel, print manager, Creating folders, files, icons, shortcuts
4. MS – WORD – Creating new documents, typing, deleting, selecting text, undo, Redo, formatting text – auto format, formatting characters, drop caps, Paragraphs, line spacing, margins, page setup, headers and footers
5. MS – WORD- Writer's tools – spelling checker, auto format, auto correct, find and replace Mail merge – Data source, Main document, creating mail merge document.
6. MS – EXCEL - Creating worksheet, Graphs, resizing graphs, formulas, if Statement, types of functions
7. MS-PowerPoint-Creating presentation, slideshow, adding slides, inserting clip arts, smart art, images, sound files, linking etc.
8. Creating Certificate in Power point and word
9. Creating Resume
10. Creating Banner in word and PowerPoint
11. Internet – creating e – mail accounts, browsing.
12. Demonstration of different charts using excel.
13. Demonstration of different slide show technique
14. Demonstration of different page formatting in word and excel
15. Creating Certificate in word

Practical on Paper-II: - Programming Using C

1. Write a Program to convert the Temperature in centigrade degree to the Fahrenheit degree.
2. Write a program to find out First Fifty Prime numbers.
3. Write a program to convert given Binary number into its Octal / Decimal, Hexadecimal Equivalent.
4. Write a program to display Fibonacci series.
5. Write a Recursive function to find out the Factorial of Given Number.
6. Write a program to remove blank lines from a file.
7. Write a program to count the no. of character, words, lines and spaces in a given text file.
8. write a program to calculate Matrix Addition, Multiplication using Functions as well as without Function.
9. Write a program to find given string is Palindrome or not using function.
10. Write a program that accepts the Roll No, Name, Marks obtained in three tests of 'N' students & display the total and Average in tabular format.
11. Write a program for Armstrong number
12. Write a program for matrix inverse and transpose
13. Write a program to store book information in file
14. Write a program to access arrays using pointer.
15. Write a program to implement strcmp, strlen,strcpy functions.

Practical on Paper-III: - Introduction to Web Designing

1. Design HTML page to display student Information
2. Design HTML page for all types of lists.
3. Design HTML page for Image map, table, and frameset tags.
4. Create a web page using the Internal/Linked/External style sheet using Text formatting properties, CSS Borders, Margin Properties, Color properties, Use DIV and SPAN tag properties.
5. Write a JavaScript code working with functions: the alert Box, the confirm Box, the prompt Box etc.
6. Write JavaScript program to check given number is
    a. even or odd,
    b. Prime or not
    c. Palindrome or not.
    d. perfect or not
    e. Armstrong or not
7. Write a JavaScript code block using objects: String Object, Boolean Object, Number Object, Date Object, Math Object, History Object, Screen Object, Location Object etc.
8. Write a JavaScript to convert the Temperature in centigrade degree to the Fahrenheit degree.
9. Write a JavaScript to find out First Fifty Prime numbers.
10. Write a JavaScript to validate form. Use email validation, pin code validation, require validation.
11. Write a JavaScript to demonstrate window object.
12. Write a JavaScript to demonstrate Navigation object.
13. Write a JavaScript for addition of n numbers in array
14. Design web page to demonstrate internal linking of document.
15. Design small website containing 10 web pages.

Practical on Paper IV:-Operating System

1. Write a C program for implementation of Priority scheduling algorithms
2. Write a C program for implementation of Round Robin scheduling algorithms
3. Write a C program for implementation of FCFS scheduling algorithms.
4. Write a C program for implementation of SJF scheduling algorithms.
5. Write a C program to simulate the concept of Dining-Philosophers problem.
6. Write a c program to implement Threading and Synchronization Applications.
7. Write a C program to implement banker's algorithm for deadlock avoidance.
8. Write a C program to implement algorithm for deadlock detection.
9. Write a C program for implementation memory allocation methods for fixed partition
10. Write a C program to simulate the following contiguous memory allocation techniques
    a) Worst-fit b) Best-fit c) First-fit
11. Write a c program to implement Paging technique for memory management.
12. Write a C program for implementation of FIFO, LRU and LFU page replacement algorithm.
13. Write a C program for creating and deleting directory.
14. Write a C program to display current date and time.
15. Write a C program to implement dir command

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-I- Fundamentals of Computer	Paper-I- Fundamentals of Computers
2)	Paper-II- Programming Using C-I	Paper-II- Programming Using C
3)	Paper-III Introduction to Web Designing	Paper-III Introduction to Web Designing
4)	Paper-IV- Programming Using C-II	Paper-II- Programming Using C
5)		

For Science faculty: CA- Contineous Assessment (Internal Examinations) of Total Marks: 10

Pattern / Examination nature may be as follows:

One internal examination of 10 marks or two examinations of 5 marks each.

Open book examination / Home Assignment / Classroom test / Seminar / Field Work report / Project Report etc.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B^{++}' Grade (CGPA 2.96)

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 2023)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

B. Sc-II Choice Based Credit System (CBCS)(w.e.f.2023-24)

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 Courses (*Students can opt any Three subjects among the Four Subjects offered at B. Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B. Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1C	AIC-1A	Data Structures	Paper-V	3	--	--	50	40	10	4.0
			Software Engineering	Paper-VI	3	--	--	50	40	10	
	DSC 2C			Paper-V	3	--	--	50	40	10	4.0
				Paper-VI	3	--	--	50	40	10	
	DSC 3C			Paper-V	3	--	--	50	40	10	4.0
				Paper-VI	3	--	--	50	40	10	
Total Sem.-III					**18**	--	--	**300**	**240**	**60**	**12**
	$ SEC-1		Web Design using Bootstrap and WordPress		4	--	--	100	80	20	4
Class :	**B.Sc.- II Semester –IV**										
Core Courses (*Students can opt any Three subjects among the Four Subjects offered at B.Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1D	AIC-1B	Core Java	Paper-VII	3	--	--	50	40	10	4.0
			DBMS Using Oracle	Paper-VIII	3	--	--	50	40	10	
	DSC 2D			Paper-VII	3	--	--	50	40	10	4.0
				Paper-VIII	3	--	--	50	40	10	
	DSC 3D			Paper-VII	3	--	--	50	40	10	4.0
				Paper-VIII	3	--	--	50	40	10	
	Environmental Studies				**3**	--	--	**50**	**40**	**10**	**NC**
Total Sem-IV					**18**			**300**	**240**	**60**	**12**
Total (Theory)					**36**	--	--	**600**	**480**	**120**	**24**
Core Practical	DSC 1C & 1D	AIC 1A & 1B		Pr. II &III	--	--	8	200	160	40	4.0
	DSC 2C & 2D			Pr. II & III	--	--	8	200	160	40	4.0
	DSC 3C & 3D			Pr. II & III	--	--	8	200	160	40	4.0
Total (Practicals)							**24**	**600**	**480**	**120**	**24**
Grand Total					**36**		**24**	**1200**	**960**	**240**	**48**
	$ SEC-1				**4**			**100**	**80**	**20**	**4**

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

Additional Interdisciplinary Courses - Geochemistry/Biochemistry/Meteorology/Plant Protection/NCC etc.

$The students can choose MOOCs/ NPTEL/SWAYAM/Path Shala/Add-on / Skill based courses of university/college-initiated courses of same credits.

$ These courses are not compulsory, but after completion of these courses students get additional credits on their mark lists.

$ SEC courses run by colleges should be communicated to university for information & necessary action.

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.

Equivalence papers for B.Sc-II Sem III and IV (Computer Science)

Sr.no.	Old Paper	New Paper
1	Paper-V Data Structure	Paper-V-Data Structure
2	Paper-VI Design analysis and Algorithm	No equivalence
3	Paper-VII-Software Engineering	Paper-VI-Software Engineering
4	Paper-VIII-Database Management System	Paper-VIII-Database Management System

B.Sc. (Computer Science)-II Semester – III
Paper – V: Data Structures

Teaching Scheme:
Lectures – 3 Hours/week, 2 Credits

Examination Scheme:
UA – 40 Marks
CA – 10 Marks

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 the concepts about stacks, queues, lists, trees and graphs
4. To impart the basic concepts of data structures and algorithms

Unit 1 **(10)**

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: -
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

B.Sc. (Computer Science)-II Semester – III
Paper – VI: Software Engineering

Teaching Scheme:
Lectures – 3 Hours/week, 2 Credits

Examination Scheme:
UA – 40 Marks
CA – 10 Marks

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 **(10)**

System concepts: Introduction system, characteristics, Elements of system, Types of system, System Analysis, Role of System Analyst. Software Engineering: Definition, Characteristics of software, Qualities of software. System Development life cycle- Waterfall model, V-shape model, Spiral model, Prototyping, incremental, RAD, Agile.

Unit 2 **(15)**

Software requirements: Types of Requirements: System, Functional, Non-functional, User. Fact finding techniques: Interviews, Questionnaire, Record reviews, Observation. Analysis and Design Tools: Flow chart, Decision tables and Trees, Structured English, HIPO. System Design: Data flow Diagram (Physical, Logical), Entity relation diagram ERD, Data Dictionary, structured chart, Input and output design,

Case studies: Pay Roll, Fixed Deposit, Inventory system, College Admission System, Library System, Loan system etc.

Unit 3 **(15)**

Coding: Coding standards, Size Estimation, Effort Estimation, and Cost Estimation, Software Testing: Need of Testing, types of testing, Software Implementation and Maintenance: Traditional and incremental approaches, conversion methods, Overview of maintenance process, types of maintenance. Software Quality Assurance: SQA Tasks, Goals and Metrics, Software Reliability. Software risk management: definition, types of risk, risk identification-risk monitoring and management.

Course Outcome: -

1. At the end of the course, the student should be able to:
2. Basic knowledge and understanding of the analysis and design of software systems.
3. Ability to apply software engineering principles and techniques to develop, maintain and evaluate large-scale software systems.
4. To produce efficient, reliable, robust and cost-effective software solutions.
5. Ability to perform independent research and analysis.
6. 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.

B.Sc. (Computer Science)-II Semester – III
SEC-1: Web Design using Bootstrap and WordPress

Teaching Scheme:
Lectures & Practical – 4 Hours/week, 4 Credits

Examination Scheme:
UA – 80 Marks
CA – 20 Marks

Course Objectives:

1. to study development of responsive website using bootstrap
2. To get knowledge about bootstrap built-in components design, grids, fluid grids, and responsive layout.
3. To get knowledge about global Bootstrap CSS classes for images, typography, tables, grids, forms, buttons, and more
4. To understand the reusable bootstrap components including icons, dropdowns, alerts navbars, breadcrumbs, popovers, and many more.
5. To Understand CMS and what are themes, Plugins and widgets in WordPress

Unit 1 **(15)**

Introduction about Bootstrap, Bootstrap History, Why Use Bootstrap, Downloading Bootstrap, Bootstrap CDN, Downloading the Bootstrap Files, Understanding the File Structure

Layout- Bootstrap Grid System, Creating Fixed Layout, Fluid Layout, Responsive Web Design or Layout, Bootstrap Typography

Bootstrap Forms- Form control, Select, Checks & radios, Range, Input group, Floating labels, Layout, Validation

Bootstrap Tables, Lists, Images, Media Objects, Icons

Unit 2 **(25)**

Bootstrap Components-Accordion, Alerts, Badge, Breadcrumb, Buttons, Button group, Card, Carousel, Close button, Collapse, Dropdowns, List group, Modal, Navbar, Navs & tabs, Offcanvas, Pagination, Placeholders, Popovers, Progress, Scrollspy, Spinners, Toasts, Tooltips

Case study-Design e-commerce and your college website

Unit 3 **(20)**

Introduction CMS And WordPress, Why CMS, Advantages and Disadvantages of CMS, com vs. WordPress.org

Creating a WordPress Site, Installing WordPress, Setting up WordPress in Local Server, Logging Into the WordPress Admin & General Site Settings

Writing Posts & Formatting Text : Posts versus Pages, Creating a New Blog Post, Using the Visual Editor, Pasting Without Formatting & Clearing Formatting, Formatting Headings, Formatting Bulleted & Numbered Lists, Formatting Blockquotes, Publishing a Post, Deleting a Post, Restoring a Post from the Trash (or Deleting it Delete Permanently)

Creating Pages, formatting page, Publishing pages, Menu, Installing Themes, adding plugins, Working with Widgets

Course Outcome:

1. To build and experiment websites
2. Get Knowledge of bootstrap built-in components design, grids, fluid grids, and responsive layout.
3. Understand global Bootstrap CSS classes for images, typography, tables, grids, forms, buttons, and more
4. Understand the reusable bootstrap components including icons, dropdowns, alerts navbars, breadcrumbs, popovers, and many more.
5. Utilize the bootstrap javascript Plugins to develop modern web pages.
6. Customize Bootstrap's elements with fewer variables and jQuery plugins to build our version.
7. Build attractive website using WordPress or BootStrap.

Reference Books:

1. Bootstrap 5 Foundations by Daniel Foreman, Foreman Technology LTD; 2nd edition
2. Bootstrap: Responsive Web Development by Jake Spurlock, Shroff; First Edition
3. https://getbootstrap.com/docs/5.3/
4. WordPress 4.0 Site Blueprints 2nd Edition: Build Your Own Website Using Best Practices,
5. WordPress 5 Complete: Build beautiful and feature-rich websites from scratch, 7th Edition, by Karol Król, Packt Publishing

B.Sc. (Computer Science)-II Semester – IV
Paper – VII: Core Java

Teaching Scheme:
Lectures – 3 Hours/week, 2 Credits

Examination Scheme:
UA – 40 Marks
CA – 10 Marks

Course objectives: -

1. To understand how to design, implement, test, debug programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions in Java.
2. To understand the importance of Classes & objects along with constructors and Arrays in Java.
3. To understand 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.
4. To understand importance of multi-threading & different exception handling mechanisms.
5. To understand how to develop GUI applications using Swing and JDBC technology

Unit 1: (15)

Introduction to Java Programming: 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,

Object oriented programming in Java: 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 2: (10)

Exception Handling: 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

Unit 3: (15)

Introduction to JDBC, Components of JDBC, Architecture of JDBC, JDBC Drivers

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

Course Outcomes: -

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

B.Sc. (Computer Science)-II Semester – IV
Paper – VIII: DBMS Using Oracle

Teaching Scheme:
Lectures – 3 Hours/week, 2 Credits

Examination Scheme:
UA – 40 Marks
CA – 10 Marks

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.

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)**

SQL: DDL, DML, DCL, select: From, Where, Order by, Group by, Having, Intersect, Union, Distinct, Between, In, Between, Different types of functions, Delete, Update, Insert, Nested queries, joins, create, alter and drop, constrains, index, views, Triggers, Grant, Revoke, Commit, RollBack, Savepoint
Introduction to PL/SQL, Advantages, Architecture, Datatypes, Variable and Constants, Using Built_in Functions, Conditional, Looping and Iterations Statements. Cursor in PL/SQL: Types of Cursors, Cursor Attributes, Cursor with Parameters, Cursors with LOOPs Nested Cursors, Cursors with Sub Queries and procedure. Procedures in PL/SQL: STORED PROCEDURES, PROCEDURE with Parameters (IN,OUT and IN OUT), Dropping a Procedure.
Functions in PL/SQL: Difference between Procedures and Functions, types of functions and parameter modes
Exceptions in PL/SQL

Course Outcome:-

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 & PL/SQL.

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

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 Core Java

1. To learn use of single dimensional array by defining the array dynamically.
2. Write a program that show working of different functions of String and StringBufferclasss like setCharAt(), setLength(), append(), insert(), concat()and equals().
3. 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
4. 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.
5. 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
6. 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).
7. 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.
8. Write a program to show the use of nested try statements that emphasizes the sequence of checking for catch handler statements.
9. 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).
10. Write a program to demonstrate priorities among multiple threads.
11. Write a program to demonstrate multithread communication by implementing synchronization among threads (Hint: you can implement a simple producer and consumer problem).
12. Write a program to demonstrate different mouse handling events like mouseClicked(), mouseEntered(), mouseExited(), mousePressed, mouseReleased() and mouseDragged() and keyboard handling events.
13. Write a program to demonstrate the use of push buttons.
14. Write a program to demonstrate collection classes.
15. Write a program to implement interface.

Sample Practical Assignment on DBMS Using Oracle

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.

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

NAAC Accredited-2022
'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Botany

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

(Syllabus to be implemented from June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Choice Based Credit System (CBCS), (w.e.f.2022-23) Revised 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 Compulsory Course (AECC)		English Paper I Part-A (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		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**	--	--	**450**	**360**	**90**	**18**
Class:	**B.Sc.- I Semester – II**									
Ability Enhancement Course (AECC)		English Paper I Part-B (communication skill)		4.0			50	40	10	2.0
Core Courses (*Students can opt any Four Subjects from the Twelve Subjects Listed below.		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			50	40	10	NC
Total (Theory)				**24**	--	--	**450**	**360**	**90**	**18**
Core Practical		DSC 1 A & 1B	Practical I	--	--	4	100	80	20	4.0
		DSC 2 A & 2B	Practical I	--	--	4	100	80	20	4.0
		DSC 3A & 3B	Practical I	--	--	4	100	80	20	4.0
		DSC 4A & 4B	Practical I	--	--	4	100	80	20	4.0
Total (Pract.)						**16**	**400**	**320**	**80**	**16**
Grand Total				**48**		**16**	**1300**	**1040**	**260**	**52**

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS) (w.e.f. 2023-24)

Revised 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 Courses (*Students can opt any Three subjects among the Four Subjects offered at B. Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B. Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1C	AIC-1A	Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 2C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
	DSC 3C		Paper-V	3	--	--	50	40	10	4.0
			Paper-VI	3	--	--	50	40	10	
Total Sem.-III				**18**	--	--	**300**	**240**	**60**	**12**
	$ SEC-1			4	--	--	100	80	20	4
Class:	**B.Sc.- II Semester –IV**										
Core Courses (*Students can opt any Three subjects among the Four Subjects offered at B.Sc. I. **OR** Students can opt any Two subjects among the Four Subjects offered at B.Sc. I and any one from the Additional Interdisciplinary subjects.	DSC 1D	AIC-1B	Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 2D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	DSC 3D		Paper-VII	3	--	--	50	40	10	4.0
			Paper-VIII	3	--	--	50	40	10	
	Environmental Studies			**3**	--	--	**50**	**40**	**10**	**NC**
Total Sem-IV				**18**			**300**	**240**	**60**	**12**
Total (Theory)				**36**	--	--	**600**	**480**	**120**	**24**
Core Practical	DSC 1C & 1D	AIC 1A & 1B	Pr. II &III	--	--	8	200	160	40	4.0
	DSC 2C & 2D		Pr. II & III	--	--	8	200	160	40	4.0
	DSC 3C & 3D		Pr. II & III	--	--	8	200	160	40	4.0
Total (practical)						**24**	**600**	**480**	**120**	**24**
Grand Total				**36**		**24**	**1200**	**960**	**240**	**48**
	$ SEC-1			**4**			**100**	**80**	**20**	**4**

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

Additional Interdisciplinary Courses - Geochemistry/ Biochemistry/ Meteorology/ Plant Protection/ NCC etc.

$The students can choose MOOCs/ NPTEL/ SWAYAM/ Path Shala/ Add-on / Skill based courses of university/ college-initiated courses of same credits.

$ These courses are not compulsory, but after completion of these courses' students get additional credits on their mark lists.

$ SEC courses run by colleges should be communicated to university for information & necessary action.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology

Choice Based Credit System (CBCS) (w.e.f.2024-25) Revised 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 II Part A	4	--	--	50	40	10	2.0
Core Courses: (Students can opt any one subjects among the three Subjects excluding Interdisciplinary/Additional subject offered at B. Sc-II.)		DSC 1 E	Paper IX	4	--	--	100	80	20	4.0
		DSC 1 F	Paper X	4	--	--	100	80	20	4.0
		DSC 1 G	Paper XI	4	--	--	100	80	20	4.0
		DSE 1 A/B/C	Paper XII	4	--	--	100	80	20	4.0
Total Theory Sem-V				**20**	**--**	**--**	**450**	**360**	**90**	**18**
	$ SEC-2			4	--	--	100	80	20	4.0
Class:	**B.Sc.- III Semester –VI**									
Ability Enhancement Course (AECC)		English (Business English)	Paper II Part B	4	--	--	50	40	10	2.0
Core Courses': (Students can opt anyone subjects among the three Subjects excluding interdisciplinary / Additional subject offered at B.Sc. II.		DSC 1 H	Paper XIII	4	--	--	100	80	20	4.0
		DSC 1 I	Paper XIV	4	--	--	100	80	20	4.0
		DSC 1 J	Paper XV	4	--	--	100	80	20	4.0
		DSE 2 A/B/C	Paper XVI	4	--	--	100	80	20	4.0
Total Theory Sem-VI				**20**	**--**	**--**	**450**	**360**	**90**	**18**
Core		DSC 1E &1H	Practical IV	--	--	5	100	80	20	4.0
		DSC 1F & 1 I	Practical V	--	--	5	100	80	20	4.0
		DSC 1G & 1 J	Practical VI	--	--	5	100	80	20	4.0
		DSE 1A/B & 2 A/B	Practical VII	--	--	5	100	80	20	4.0
Total (Practicals)						**20**	**400**	**320**	**80**	**16**
Grand Total				**40**		**20**	**1300**	**1040**	**260**	**52**
	$ SEC- 2			**4**			**100**	**80**	**20**	**4**

$The students can choose MOOCs/ NPTEL/SWAYAM/Pathshala/Add-on / Skill based courses of university/college-initiated courses of same credits.

$ These courses are not compulsory, but after completion of these courses students get additional credits on their Mark lists. $SEC Courses initiated by colleges should be communicated to university for information and necessary action.

Summary of the Structure of B.Sc. Program as per CBCS pattern

Class	Semester	Marks-Theory	Credits-Theory	Marks-Practical	Credits-Practical's	Total - credits
B.Sc.-I	I	450	18	--	--	18
	II	450	18	400	16	34
B.Sc.-II	III	300	12	--	--	12
	IV	300	12	600	24	36
B.Sc.-III	V	450	18	--	--	18
	VI	450	18	400	16	34
Total		2400	96	1400	56	152
	SEC sem.- III & V	200	8			8

B. Sc. Programme:

Total Marks **:** Theory + Practicals = 2400(+200) +1400 =3800+200
Credits : Theory + Practicals = 96(08) + 56 = 152+08
Numbers of Papers Theory: Ability Enhancement Compulsory Course (AECC) 04
Theory: Discipline Specific Core Paper (DSC) 20
Theory: Discipline Specific Elective paper (DSE) 02
Skill Enhancement Course (SEC) 04
Total : Theory Papers (Core paper-22) 30
: Practical Papers 11

Abbreviations:

L: Lectures T: Tutorials P: Practical UA: University Assessment CA: College Assessment CC: Core Course AEC: Ability Enhancement Course DSE: Discipline Specific Elective Paper SEC: Skill Enhancement Course, AIC: Additional Interdisciplinary Courses

Note: Each theory papers of 50 Marks should be of two Units.
Each theory papers of 100 Marks should be of four Units.
Each theory paper Unit is of 15 Lectures.
Practical paper of 100 Marks is of at least 20 practicals.

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Microbiology & Phycology	Microbiology & Phycology
2)	Fungi & Archegoniate	Fungi & Archegoniate
3)	Plant Ecology	Plant Ecology
4)	Taxonomy of Angiosperms	Taxonomy of Angiosperms

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

BOS Section

The following points required in the syllabus:

1) **Introduction:** This course includes four papers Paper I: Microbiology & Phycology Paper II: Fungi & Archegoniate Paper III: Plant ecology & Paper IV: Taxonomy of Angiosperms. Each paper consists of two units. All these papers help students to improve their basic knowledge about microbes, algae, fungi, ecology, and Taxonomy.
2) **Advantages of Course:** All these papers will be helpful to improve their skills in microbiology field, identification of algae, fungi, and different plant species their ecological & medicinal importance. Practical based on these papers will be helpful to develop skills & understanding all the basic loopholes in every technique. These papers act as baseline to their next year studies.
3) **Objectives of the Course:** 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, knowledge about the characters, classification, and economic importance of algae. To get the knowledge about the general characters, occurrence, classification, thallus organization & reproduction of Cyanophyta division along with the example *Nostoc,* of Chlorophyta division along with the example *Spirogyra.* To get the knowledge about characters, mode of nutrition & classification of the true fungi. To get the knowledge about the fungal division Zygomycota, Ascomycotina, To get knowledge about introduction & general characters of Archegoniate get the knowledge about the Bryophytes with suitable example, get the knowledge about the Pteridophytes with suitable example, get the knowledge about the Gymnosperms with suitable example. To get the knowledge about the climatic and edaphic factors of environment, ecological adaptations, the forms & structure of community along with qualitative and quantitative characters of community, To get the knowledge about introduction, components of ecosystem, ecological pyramids with food chain and food webs, about the ecological succession, To get knowledge about different concepts in taxonomy understand different classification systems and its merit & demerits, understand identification methods, nomenclature, principles and rules of ICBN, technique of herbarium preparation and its significance, study morphological & reproductive characters of families.
4) **List of books recommended:**

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. 6thedition.

3. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
4. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. AravaliInternational, 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.
7. Vashistha, P.C., Sinha, A.K., Kumar, A. (2010). Pteridophyta. S. Chand. Delhi, India.
8. Bhatnagar, S.P. & Moitra, A. (1996). Gymnosperms. New Age International (P) LtdPublishers, New Delhi, India.
9. Parihar, N.S. (1991). An introduction to Embryophyta: Vol. I. Bryophyta. Central BookDepot. Allahabad.
10. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R. (2005). Biology. Tata McGraw Hill,Delhi.
11. Vander-Poorteri 2009 Introduction to Bryophytes. COP.
12. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.
13. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley& Sons (Asia) Singapore. 4th edition.
14. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press,Cambridge. 3rd edition.
15. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi and Their Allies, MacmillanPublishers India Ltd.
16. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
17. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
18. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
19. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
20. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. AravaliInternational, New Delhi.
21. 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.
22. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi
23. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
24. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
25. Odum, E.P. Ecology. Oxford & F. B. h. Publishing Co. pvt. LTD-New Delhi.
26. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. BenjaminCummings Publication Co., California.
27. Kormondy, E.J. 1996. Concepts of Ecology, Prentice-Hall of India Pvt. Ltd., New Delhi.
28. Hill, M.K. 1997. Understanding Environmental Pollution. Cambridge University Press.
29. Mackenzie, A. et al. 1999. Instant Notes in Ecology. Viva Books Pvt. Ltd., New Delhi.
30. Ashok Bendre / Ashok Kumar Economic Botany Rastogi Publications Shivaji Road, Meerut – 250002 India.
31. Prof. M.A. Khan – Environment, Biodiversity and Conservation S-B Nangia, A.P.H.Publishing Corporation, 5, Ansari Road, Daryaganj New Delhi – 110002.
32. B.P. Pandey – Modern Practical Botany Vol – I / II Chand & Company Ltd. RamnagarNew Delhi – 110055.
33. R.S. Shukla & P. S. Chandel. Plant Ecology. S. Chand & Company LTD. Ram Nagar,New

Delhi.110055.
34. Pavas Divan – Environ Protection – Deep & Deep Publications D-I 124, RajouriGarden,New Delhi – 110027.
35. P.S. Verma / V.K. Agrawal – Concept of Ecology, S. Chand & Lonpan Ltd. Ramnagar,New Delhi – 110055.
36. Eug Warming – Ecology of Plants, Ambey Publications Delhi (India)
37. Evgene P Odum – Ecology Oxford & IBH Publishing Co. Pvt. Ltd. Culcutta, New Delhi.
38. Ishwar Prakash. Desert Ecology. Scientific Publications, Ratandas Road,Jodhpur.-342001-India.
39. T.W. Woodhead. Plant Ecology. SonaliPublications.New Delhi.110002.
40. Eug. Warming. Ecology of Plant. Ambey Publications Delhi.
41. Jonathan Silvertown. Introduction To Population Plant Ecology. Longman Singapure. Publisher, LTD.
42. Morphology of Angiosperms, J M Coulter and C J Chamberlain, Pointer Publishers, Jaipur.
43. Taxonomy of Angiosperm R Pandey, S Chand and Co. Ltd, Ramnagar New Delhi.110055
44. An Introduction to Taxonomy of Angiosperms- Pritish Shukla, Shital P Mishra, VikasPublishing House, Pvt. Ltd. Gaziabad, UP.
45. A Text Book of Angiosperms-B P Pandey, S Chand and Co Ltd. Ramnagar, NewDelhi.110055
46. A Text Book of Botany -'Angiosperm,V Singh C Pande, D K Jain, Rastogi Publication,Shivaji Road Meerut.250002
47. Taxonomy of Angiosperm, Neeru Mathur, Sonali Publications, New Delhi, 110002.
48. Angiosperms-G L Chopra, Pradeep Publications, Jalandhar, 144008.
49. Simpson, M.G. (2006). *Plant Systematics.* Elsevier Academic Press, San Diego, CA,U.S.A.
50. Singh, G. (2012). *Plant Systematics:* Theory and Practice. Oxford & IBH Pvt. Ltd., NewDelhi. 3rd edition.
51. Jeffrey, C. (1982). An introduction to plant Taxonomy, Cambridge University Press,Cambridge.
52. Judd, W.S., Campbell, C.S., Kellog, E.A., Steven, P.F. (2002). Plant Systematics-A Phylogenetic approach. Sinauer Associates Inc., U.S.A. 2nd edition
53. Maheshwari j.k. (1963). Flora of Delhi. CSIR, New Delhi.
54. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA,U.S.A.
55. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., NewDelhi. 3rd edition.
56. Gaikwad, S. P. & Garad, K. U. (2015). *Flora of Solapur District*, Laxmi Book PublicationSolapur.

5) List of Laboratory Equipments, Instruments, Measurements etc.

Compound microscope

Dissecting microscope

17. Rules and regulations and ordinance if any As per PAH Solapur University Solapur

18. Medium of the language: English

19. Structure of the Course:

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. Internalmarks 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 there solutions of the respective faculties and Academic Council.

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

G. 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.

H. 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.

I. 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.

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

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

L. For the faculties of Education, Law, Engineering the course structure shall be as per theresolutions of the respective faculties and Academic Council.

20. Allotment of workload (Theory/Practical)

21. Staffing of pattern –As per UGC rules.

22. Intake capacity of students

23. Paper duration –two hours

24. To be introduced from: June 2022

PUNYASHLOK AHILYADEVI HOLKAR

Solapur University, Solapur

Faculty of Science

Choice Based Credit System (CBCS), (W. E. F. June 2022)

Structure for B. Sc-I

***Core Subjects: Botany**

Objective and Outcome of the CourseSyllabus of B. Sc.-I, CBCS Pattern Botany, w.e.f. June-2022

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**:**

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 2 : Phycology

Objective: To get the knowledge about the characters, classification, and economic importanceof algae

Outcome: The student can understand importance of algae

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 example of *Nostoc.*

Xanthophyta

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

Outcome: The student can understand in detail about the division Cyanophyta along example of *Vaucheria*

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 example of *Spirogyra*

Rhodophyta

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

Outcome: The student can understand in detail about the division chlorophyta along example of *Polysiphonia*

Paper -II
Fungi and Archegoniate

Unit 1: Fungi

Objective: To get the knowledge about characters, mode of nutrition & classification of thetrue 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.

Ascomycotina

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 gets a detailed idea about Archegoniate

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.

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.

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.

Ecological Adaptations

Objective: To get the knowledge about the ecological adaptations.

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

Unit 2: 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

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

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

Classification

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

Outcome: The student can understand about classification systems in taxonomy

Unit 2: 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

Herbarium and Botanical Garden

Objective: To understand technique of herbarium preparation and significance

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

Study of Angiosperm families

Objective: To study morphological & reproductive characters of 4 families

Outcome: The student can understand detailed identifying characters of family

Syllabus of B. Sc. Part-I, CBCS Pattern

Botany, w.e.f. June-2022

DSC- 1 -A Semester- I

Paper No-I: Microbiology & Phycology (Lecture 30)

Unit- 1: Microbiology

1.1- Introduction- Microbiology **(2 L)**

1.2- Viruses: General characters, structure, classification, and economic importance of viruses. **(3 L)**

1.3- DNA virus: (T- Phage), RNA Virus (TMV). **(2 L)**

1.4- Bacteria: General characters of bacteria, structure, Economic importance, Modes of reproduction vegetative, asexual & recombination (conjugation, transformation & transduction). **(5 L)**

1.5- Mycoplasma: General characters, Structure, classification and significance, Economic importance. **(3 L)**

Unit- 2: Phycology

2.1- Introduction; general characters and classification of algae (As per Smith-1955) up to class; Economic Importance of Algae. **(3 L)**

2.2- Cyanophyta: General Characters; Study of *Nostoc*- occurrence, classification, thallus structure and reproduction (excluding developmental stages). **(3 L)**

2.3- Xanthophyta: General characters; Study of *Vaucheria*- occurrence, classification, thallus structure and reproduction (excluding developmental stages). **(3 L)**

2.4- Chlorophyta: General Characters; Study of *Spirogyra*- occurrence, classification, thallus structure and reproduction (excluding developmental stages). **(3 L)**

2.5- Phaeophyta: General characters & life cycle of *Sargassum* occurrence, classification, thallus structure and reproduction (excluding developmental stages). **(3 L)**

- **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
6. R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
7. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata Mc Graw-Hill Co, New Delhi.

Paper-II: Fungi & Archegoniate (Lecture 30)

Unit- 1: Fungi **(15 L)**

1.1- General characters; Nutrition and classification of fungi up to class (as per Ainsworth); Economic importance of Fungi. **(3 L)**

1.2- Zygomycotina: General characters; study of *Mucor*- occurrence, thallus organization, classification, and life cycle (excluding developmental stages). **(3 L)**

1.3- Ascomycotina: General characters; study of *Yeast*- occurrence, thallus organization, classification, and life cycle (excluding developmental stages). **(3 L)**

1.4- Basidiomycotina: General characters: study of *Agaricus* occurrence, thallus organization, classification, and life cycle (excluding developmental stages). **(3 L)**

1.5- Oomycota: General characters: Study of *Albugo*- occurrence, thallus organization, classification, and life cycle (excluding developmental stages). **(3 L)**

Unit- 2: Archegoniate **(15 L)**

2.1- Introduction & General character. **(2 L)**

2.2- Bryophytes: General characters and Classification (as per G. M. Smith); Study of *Riccia*- occurrence, classification, thallus structure (external & internal), and reproduction (excluding development); Economic importance of Bryophytes. **(3 L)**

2.3- Pteridophytes: General characters and classification up to class (as per G. M. Smith); Study of *Selaginella*- occurrence, classification, morphology of sporophyte, anatomy (stem) and reproduction (excluding development); Economic importance of Pteridophyte. **(3 L)**

2.4- **Gymnosperms:** General characters and classification (As per Sporne). **(2 L)**

2.5- Study of *Cycas*- classification, occurrence, morphology (sporophyte, corolloid root), anatomy of leaflet and reproduction (excluding development); Economical importance of Gymnosperms. **(5 L)**

- **References Book**

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.
5. Vander-Poorteri 2009 Introduction to Bryophytes. COP.
6. Agrios, G.N. 1997 Plant Pathology, 4th edition, Academic Press, U.K.
7. Alexopoulos, C.J., Mims, C.W., Blackwell, M. (1996). Introductory Mycology, John Wiley & Sons (Asia) Singapore. 4th edition.
8. Webster, J. and Weber, R. (2007). Introduction to Fungi, Cambridge University Press, Cambridge. 3rd edition.
9. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi and Their Allies, Macmillan Publishers India Ltd.
10. Sharma, P.D. (2011). Plant Pathology, Rastogi Publication, Meerut, India.
11. Lee, R.E. (2008). Phycology, Cambridge University Press, Cambridge. 4th edition.
12. Prescott, L.M., Harley J.P., Klein D. A. (2005). Microbiology, McGraw Hill, India. 6th edition.
13. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West Press, Delhi.
14. Sahoo, D. (2000). Farming the ocean: seaweeds cultivation and utilization. Aravali International, New Delhi.
15. Campbell, N.A., Reece J.B., Urry L.A., Cain M.L., Wasserman S.A. Minorsky P.V., Jackson
16. R.B. (2008). Biology, Pearson Benjamin Cummings, USA. 8th edition.
17. Pelczar, M.J. (2001) Microbiology, 5th edition, Tata McGraw-Hill Co, New Delhi.

Syllabus of B.Sc. Part-I, CBCS Pattern Botany

Botany, w.e.f. June-2022

DSC- 1-A Semester- II

Paper No-III: Plant Ecology (Lecture 30)

Unit 1: Introduction, Climatic Factor & Ecological Adaptations (15 L)

1.1- Basic concept; levels of organization; interaction between living world & environment. **(3 L)**

1.2. Climatic factors- Light, Temperature, Humidity, Wind & Rainfall. **(3 L)**

1.3. Edaphic factors- Soil: origin, formation, composition, physical, chemical & biological components, classification & chemical properties of soil. **(4 L)**

1.4. Ecological adaptations: Introduction. **(1 L)**

1.5. Hydric Adaptations, Xeric Adaptations. **(4 L)**

Unit 2: Plant communities, Ecosystem & Ecological succession (15)

2.1. Plant Communities: Introduction, forms & structure, classification, qualitative and quantitative characters of community. **(4 L)**

2.2 Ecosystem: Introduction, components of ecosystem, ecological pyramids, food chain and food webs. **(4 L)**

2.3. Trophic level organization, basic source of energy, autotrophy, heterotrophy, symbiosis, commensalism, parasitism. **(4 L)**

2.4. Ecological succession: Introduction, concept & process. **(1 L)**

2.5. Hydrosere and Xerosere. **(2 L)**

- **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.
3. Odum, E.P. Ecology. Oxford & F. B. h. Publishing Co. pvt. LTD- New Delhi.
4. Barbour, M.G., Burk, J.H. and Pitts, W.D. 1987. Terrestrial Plant Ecology. Benjamin Cummings Publication Co., California.
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
9. 250002 India.
10. Prof. M.A. Khan – Environment, Biodiversity and Conservation S-B Nangia, A.P.H. Publishing Corporation, 5, Ansari Road, Daryaganj New Delhi – 110002.
11. B.P. Pandey – Modern Practical Botany Vol – I / II Chand & Company Ltd. Ramnagar New Delhi – 110055.
12. R.S. Shukla & P. S. Chandel. Plant Ecology. S. Chand & Company LTD. Ram Nagar, New Delhi.110055.
13. Pavas Divan – Environ Protection – Deep & Deep Publications D-I 124, Rajouri Garden, New Delhi – 110027.
14. P.S. Verma / V.K. Agrawal – Concept of Ecology, S. Chand & Lonpan Ltd. Ramnagar, New Delhi – 110055.
15. Eug Warming – Ecology of Plants, Ambey Publications Delhi (India)
16. Evgene P Odum – Ecology Oxford & IBH Publishing Co. Pvt. Ltd. Culcutta, New Delhi.
17. Ishwar Prakash. Desert Ecology. Scientific Publications, Ratandas Road, Jodhpur. - 01 India.
18. T.W. Woodhead. Plant Ecology. Sonali Publications.New Delhi.110002.
19. Eug. Warming. Ecology of Plant. Ambey Publications Delhi.
20. Jonathan Silvertown. Introduction To Population Plant Ecology. Longman Singapure Publisher, LTD.

Paper- IV: Taxonomy of Angiosperms (Lecture 30)

Unit- 1: Introduction of Taxonomy **(15 L)**

1.1- Introduction and definition. **(2 L)**

1.2- Aims and Principles of Taxonomy, methods of identification of plants. **(4 L)**

1.3- Primitive and advanced characters of the flower; concept of taxa (family, genus, and species). **(3 L)**

1.4- Types of classification: Artificial, Natural and Phylogenetic classifications. **(3 L)**

1.5- Outline of Bentham and Hookers system of classification; Salient features, merits and demerits of Bentham and Hookers system. **(3 L)**

Unit- 2: Identification and Nomenclature **(15 L)**

2.1- Nomenclature; Binomial nomenclature of plants. **(2 L)**

2.2- ICBN- Introduction & Principles of ICBN. **(2 L)**

2.3- Herbarium and Botanical Garden Herbarium- Steps in preparation of herbarium specimens and significance of Herbaria. **(3 L)**

2.4- Botanical gardens of India- Sir J. C. Bose Botanical Garden, Calcutta & Lead Botanical Garden of Shivaji University Kolhapur. **(3 L)**

2.5- Study of Angiosperms families: Systematic position, Morphological & distinguishing characters with economic importance of following families: **(5 L)**

a) Caesalpiniaceae b) Solanaceae

c) Amaranthaceae d) Liliaceae

- **References:**

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 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. 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 Practical (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, Fungi, Archegonites (Volvox, Gracillaria, Polysiphonia, Rhizopus, Penicilium, Agaricus, Marchantia, Adantium, Pinus,)
5. Study of Nostoc & Spirogyra.
6. Study of Sargassum & Vaucheria
7. Study of Mucor & Yeast.
8. Study of Albugo& Agaricus
9. Study of Riccia.
10. Study of Selaginella- Morphology of sporophyte and anatomy of stem, Strobilus.
11. Study of Cycas- Morphology of sporophyte and anatomy of leaflet.
12. Reproductive structure: male cone, microsporophyll, microspore and megasporophyll, L. S. of ovule (permanent slide).

13-14. Study of plant families:

   i. Caesalpiniaceae & Solanaceae
   ii. Amaranthaceae & Liliaceae

15. Study of soil PH by Universal indicator/pH paper/pH meter & Study of Water holding capacity of different soil.
16. Study of meteorological instruments (any three)
17. Determination of Density and Frequency of plants by quadrat method.
18. Ecological adaptations of Hydrophytes (Hydrilla, Eichhornia and Typha).
19. Ecological adaptations of Xerophytes (Nerium and Aloe).
20. Excursion report.

PUNYASHLOK AHILYADEVI HOLKAR

SOLAPUR UNIVERSITY, SOLAPUR

Practicals of B.Sc. Part– I Botany (Semester System) (With effect from June 2022) 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 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 wherever 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 In charge and certified by the Head of Department at the end of year. Candidates must 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 evaluate 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.

Structure of the courses: -

C) 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.

D) 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.

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

Nature of Question Paper

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Nature of Question Paper for choice-based credit system (CBCS) Semester Pattern

Faculty of Science • (w. e. f. June2022 for B.Sc.

I & From June 2023 for B.Sc. II)

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

Instructions:

1. All questions are compulsory.
2. Draw **neat, labelled diagrams wherever** necessary.
3. Figures to the **right** indicate **full marks**.

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 short 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.

Batch: .

PUNYASHLOK AHALYADEVI HOLKAR

SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part- I: Practical Examination in Botany March/April 2023

Centre: ……... Date: ……...

Time: ……... 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.

Q. 1. Identify and show the important structures observed by you in the given specimen- A, B and C leave your preparation for inspection. **24**

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

Q. 3. Set up the ecological experiment- D assigned to you and shows it to the examiner **08**

OR

Q. 3. Show the ecological adaptation in the given specimen- E. **08**

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

Q. 5. Identifications **10**

1. Identify and describe the slide/ photograph- G (Viruses/ Gram staining/ Types of bacteria).
2. Identify and describe- H (Algae/ Fungi).
3. Identify and describe- I (Bryophyte/ Pteridophyte/ Gymnosperm).
4. Identify and describe- J (Vegetative character/ Reproductive character).
5. Identify and describe the specimen- K (Meteorological instrument).

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

b. Excursion report. **10**

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

1. Hopkins, W. G. 1995. Introduction to Plant Physiology. John Wiley & Sons, Inc., New York, USA.
2. Moore, T. C. 1989. Biochemistry and Physiology of Plant Hormones. (2nd edition). Springer – Verlag, New York, USA.
3. Salisburry, F.B. and Ross, C. W. 1992. Plant Physiology. (4th edition). Wadsworth Publishing Co., California, USA. 19
4. Taiz, L. and Zeiger, E. 1998. Plant Physiology. (2nd edition) SinauerAssociates, Inc., Publishers, Massachusetts, USA.
5. R.C. Grewal – Plant Physiology. Campus Books International 483/24, Prahiad street Ansari Road, Darya ganj, New Delhi – 110002.
6. V.K. Jain – Fundamentals of Plant Physiology. S. Chand & Company Ltd. Ramnagar, New Delhi – 110055.
7. Salisbury Ross – Plant Physiology. CBS, Publishers & Distributions 485/ Jain Bhawan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
8. Devlin & Witham – Plant Physiology. CBS Publishers & Distributors 485, Jain Bhavan, Bhole Nath Nagar, Shahdara, New Delhi – 110032.
9. G. Ray Noggle / G. Fritz- Introductory Plant Physiology. Prentice Hall of India Ltd. New Delhi – 110001.
10. V.Verma. Text Book of Plant Physiology. Emkay Publications., B-19, East KrishnaNagar, Delhi-1100051.
11. V.I. Paladin. Plant Physiology. Arihant Publishers. Jaypur, (India)
12. Dr. S. Sundara rajan- Physiology of Transport in Plants. Anmol Publications, Pvt. LTD. New Delhi.110002.
13. D.O.hall & K.K. Rao. Photosyntheis. Edward Arnold, East Street, Baltimore, Mary-land- 21202,U.S.A.
14. Bidwell, R.G.S. 1974. Plant Physiology. Macmillan P ub. Co., N.Y.
15. Devlin, R.M. and F.H. Witham. 1983. Plant Physiology. Willard Grant Press. U.S.A.
16. Hans-Walter Heldt. 1997. Plant Biochemistry and Molecular Biology. Oxford University Press, New York. Usa.
17. Jain, V.K. (2000): Fundamentals Of Plant Physiology ,S.Chand&Co, New Delhi.
18. Pandey, S.N. (1991): Plant Physiology, Vikas Publishing House (P) Ltd., New Delhi, India.
19. Verma, V. (2007): Text Book of Plant Physiology. Ane Books India, New Delhi.
20. Nobel, P.S. 2009. Physicochemical and Environmental Plant Physiology.4th edition Academic Press, UK
21. Taiz, L. and Zeiger, E. 2006. Plant Physiology. 4th Edition. Sinnauers Associates, Saunders land, Massachusetts, USA
22. Helgi OPik, Stephen A. Rolfe, Arthur J. Willis. 2005. The Physiology of Flowering Plants, Cambridge University Press, UK
23. Kirkham, M.B. 2004. Principles of Soil and Plant Water Relations. Elsevier, Amsterdam, Netherlands.
24. Dennis, D.T., Turpin, D.H., Lefebvre, D.D. and Layzell, D.B. 1997. Plant Metabolism. 2nd Edition. Longman Group, U.K.
25. Fitter, A. and Hay, R.K.M. 2001. Environmental Physiology of Plants. Academic Press, UK.
26. Emil Tmog, Mineral Nutrition of Plants. Oxford and IBH Publishing House, Bombay/ New Delhi.
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
4. Carlquist, S. 1998.- Comparative Wood Anatomy: Systematic, Ecological and Evolutionary Aspects of dicotyledonous Wood.Springer – Verlag, Berlin.
5. Culter, E.G. 1969. Part I.- Cells and Tissues. Edward Arnold, London.
6. Culter, E.G. 1971. Part II- Organs.- Plant Anatomy: Experiment and Interpretation. Edward Arnold, London.
7. Esau, K. 1977. - Anatomy of Seed Plants. 2nd edition, John Wifey and Sons, New York.
8. Fahn, A. 1974. - Plant Anatomy. 2nd edition. Pergamon Press, Oxford.
9. Lyndon, R.F. 1990. - Plant Development: The Cellular Basis. Unwin Hyman, London.
10. Mauseth, J.D. 1988.- Plant Anatomy. The Bonjamin/Cummings Publishing Company Inc., Metro Park, California, USA.
11. Nair, M.N.B. 1998. - Wood Anatomy and Major Uses of Wood. Faculty of Forestry, Universiti Putra Malaysia, 43400 Serdang, Selangor D.E., Malaysia.
12. Rahvan, V. 2000.- Developmental Biology of Flowering Plants. Springer- verlag, New York.
13. Raven, P.H., Evert, R.F.and Eichhorn, S.E. 1999. - Biology ofPlants. 5th edition. W.H., Freeman and Co., Worth Publishers, New York.
14. Steeves, T.A. and Sussex, I.M. 1989. - Patterns in Plant Development. 2ndedition. Cambridge University, Press, Cambridge.
15. Thomas, P. 2000. - Trees: Their Natural History. Cambridge University Press, Cambridge.
16. Chandurkar P. J. Plant Anatomy. Oxford and IBH publication Co. New Delhi 1971
17. Greulach V A and Adams J E Plant- An introduction to Modern Biology. Toppen Co. Ltd, Tokyo,
18. Eams and Mc Daniel. An Introduction to Plant Anatomy. McGraw –Hill Book Co. Ltd and Kogakusha Co, Tokyo, Japan
19. Adriance S Foster. Practical Plant Anatomy. D Van Nostrand Co. INC, Newyork
20. Pijush Roy. Plant Anatomy. New Central Book Agency Ltd, Kolkata
21. Pandey S N and Ajanta Chadha. Plant Anatomy and Embryology.Vikas Publishing House,Pvt, Ltd, New Delhi
22. Bhojwani S S and Bhatnagar S P. An Embryology of Angiosperms.
23. Maheshwari P. An introduction to Embryology of Angiosperms.
24. Nair P K K. Essentials of Palynology.
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

---

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

NAAC Accredited-2022

'B++' Grade (CGPA 2.96)

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-2022).

Punyashlok Ahilyadevi Holkar Solapur University, Solapur,

Faculty of Science & Technology

Choice Based Credit System (CBCS)

(w.e.f. June 2022)

Choice Based Credit System: With the view to ensure worldwide recognition, acceptability, horizontal as well as vertical mobility for students completing undergraduate degree, Punyashlok Ahilyadevi Holkar Solapur University, Solapur 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 and Technology

Choice Based Credit System (CBCS),(w.e.f.2022) 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			50	40	10	2.0
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**	--	--	**450**	**360**	**90**	**18**
Class :	**B.Sc.- I Semester – II**									
Ability Enhancement Course(AECC)		English (Communication skill)	Paper- II	4.0			50	40	10	2.0
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 of Vertebrates and Developmental Biology of Vertebrates**	Paper-III **Comparative Anatomy of vertebrates**	2.5	--	--	50	40	10	4.0
			Paper-IV **Development al Biology of vertebrates**	2.5	--	--	50	40	10	
		Democracy, Elections and Good Governance		3.0			50	40	10	NC
Total (Theory)				**24**	--	--	**450**	**360**	**90**	**18**
Core		DSC 1 A & 1B	Practical I	--	--	4	100	80	20	4.0
		DSC 2 A & 2B	Practical I	--	--	4	100	80	20	4.0
		DSC 3A & 3B	Practical I	--	--	4	100	80	20	4.0
		DSC 4A & 4B **Zoology Practical**	Practical I	--	--	4	100	80	20	4.0
Total (Practical)						**16**	**400**	**320**	**80**	**16**
Grand Total				**48**		**16**	**1300**	**1040**	**260**	**52**

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

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology
Choice Based Credit System (CBCS)
(W.e.f. June 2022)

- **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 and 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.

- **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 50 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 (2022)

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)**

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

Unit 1: Phylum Protozoa to Phylum Nemathelminthes 15

1.1 Kingdom Protista: General characters and classification up to classes, locomotory organelle and locomotion in protozoa, Nutrition in protozoa

1.2 Phylum Porifera: General characters and classification up to classes, canal system in Sycon

1.3 Phylum Cnidaria: General characters and classification up to classes, Polymorphism in hydrozoa

1.4 Phylum Platyhelminthes: General characters and classification up to classes, life history of *Taenia solium*

1.5 Phylum Nemathelminthes : General characters and classification up to classes, Life history of *Ascaris lumbricoides* and its parasitic adaptations

Unit 2: Phylum Annelida to phylum Echinodermata 15

2.1 Phylum Annelida: General characters and classification up to classes, Economic importance of annelids with reference to Earthworm and Leech

2.2 Phylum Arthropoda: General characters and classification up to classes, Metamorphosis in insects, Economic importance of insects

2.3 Phylum Mollusca: General characters and classification up to classes, Economic importance of molluscs

2.4 Phylum Echinodermata: General characters and classification up to classes, Water vascular system in Asteroidea

Total -30

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

Unit 1: Protochordates to Amphibians **15**

1.1 Protochordates: General features and phylogeny of protochordata

1.2 Agnatha: General features and classification up to order: Petromyzon, Myxine

1.3: Pisces

- General features and classification up to orders of: Chondrichthyes and Osteichthyes
- Economic importance of fishes

1.4: Amphibia: General features and classification up to orders of Anura, Apoda and Urodela

Unit 2: Reptiles to Mammals **15**

2.1: Reptiles:

- General features and classification up to orders: Squamata, Testudines, Crocodilia, Sphenodontia
- Venomous and non-venomous snakes
- Types of snake venom, symptoms and treatments of snake bite

2.2: Aves

- General features and classification up to orders:

Anseriformes;	Columbiformes;	Cuculiformes;	Ciconiformes
Coraciiformes;	Falconiformes;	Psittaciformes;	Passeriformes

- Fight adaptations in birds

2.3: Mammals

- General features and classification up to orders:

Insectivora;	Chiroptera;	Lagomorpha;	Primates
Rodentia;	Carnivora;	Proboscidea;	Perrisodactyla
Artiodactyla;	Cetacea		

- 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: Comparative Account of integumentary, skeletal, digestive and respiratory system in Vertebrates **15**

1.1 Integumentary System: Integument of- Skin of *Scoliodon*, frog, *Calotes*, Pigeon, Rat

1.2 Skeletal System: Pectoral and pelvic girdle of- frog, Calotes, pigeon, rat

1.3 Digestive System: Alimentary canal of- Scoliodon, Frog, Calotes, Pigeon, Rat

1.4 Respiratory System: Brief account of skin, gills, lungs, air sacs and swim bladder

Unit 2: Comparative Account of circulatory, urinogenital, nervous system in Vertebrates **15**

2.1 Circulatory System: Structure of heart of- *Scoliodon*, frog, *Calotes*, Pigeon, Rat

2.2 Urinogenital System: Brief account of Kidney- Archinephros, Pronephros, Mesonephros, Metanephros

2.3 Nervous System: Brief comparative account of brain of- Scoliodon, frog, lizard, Pigeon, Rat

Total – 30

PAPER IV: DEVELOPMENTAL BIOLOGY OF VERTEBRATES

(Total credits 2.0, Contact Hrs 30.0)

Unit-1: Gametogenesis to Gastrulation **15**

1.1 Gametogenesis:

i) Spermatogenesis with reference to mammals
ii) Oogenesis with reference to mammals
iii) Structure of hen's egg

1.2 Fertilization

i) Concept of Fertilization
ii) Types of Fertilization
iii) Mechanism of fertilization in Human

1.3. Early Embryonic Development up to Gastrulation

i) Patterns of Cleavage
ii) Blastulation and gastrulation in Chick
iii) Fate map of blastula in Chick

1.4: Development and its Regulation

i) Cellular differentiation: Definition, mechanism of differentiation
ii) Cellular movements: Epiboly, emboly and its significance in development
iii) Apoptosis: Definition, and significance

Unit-2 General Topics **15**

2.1. General Topics in Embryology

i) Metamorphosis in frog
ii) Hormonal regulation of Metamorphosis in tadpole

2.2. Placenta in mammals

i) Types of placenta on the basis of Histology (in Mammals)
ii) Functions of Placenta,
iii) Implantation of Embryo in humans
iv) Types of twins in human

2.3. Recent Developments in Human Embryology

i) Principles of ultrasound
ii) Applications of ultrasound
iii) Causes of miscarriages

Total: 30

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, Planaria, 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*
(d) Observation and identification of protozoans, helminthes, arthropod vectors

3. Key for Identification of venomous and non-venomous 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: Pectoral and Pelvic Girdle
b) Study of mammalian skulls: One herbivorous and one carnivorous animal

5. Frog Embryology:

5.1. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs./ CD/Model/Chart/Slides/Virtual CD
5.2. Study of Metamorphosis in frog through museum specimens/ photomicrographs/ CD/Model/ Chart/Slides/Virtual
5.3 Study of eggs of frog through permanent slides or photomicrographs./ CD/Model/ Chart/Slides/Virtual

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

7. Placenta:

7.1 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**
7.2 Demonstration of Ultrasound imaging scans through Video

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

9) 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.

OR

Visit to IVF Centre / Ultrasound Imaging Centre

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)**	10

(a) Identify & classify giving reasons
(b) Identify, sketch & label
(c) Identify & describe
(d) Identify & give evolutionary significance
(e) Identify & classify giving reasons

Q.4.	Identification and explanation of mammalian placenta **(any one)**	10
Q.5.	Identification and explanation of:	10

(a) Any one bone: Identify, sketch & label
(b) Any one developmental stages of frog: Identify & explain
(c) Any one gamete of frog / rat: Identify, sketch & label
(d) Any one poisonous / non-poisonous snake: Identify & describe
(e) Any one of: canal system / parasite / W.M. of chick embryo: Identify & describe

Q.6.	Tour Report/ project report or review article submission	10
Q.7.	Laboratory Record (Journal)	10
Q8:	Viva –Voce (General)	10

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 2022 for B Sc I)

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

Instructions: (Instructions may differs for subject to subject)

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)

Q.No.3) Write short 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)

For Science faculty: CA- Continuous Assessment (Internal examinations) of Total Marks-10

Pattern/Examination nature may be as follows-

One Internal Examination of 10 marks or two examinations of 5 marks each.

Open book examination/Home Assignment/class room test/Seminar/Field work report/Project report etc.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Equivalence Subject for Old Syllabus

B.Sc. Part-I Zoology (CBCS Pattern) w.e.f. June 2022

Sr.No.	Paper No. and Name of the Old Paper	Paper No. and Name of the New Paper
1	Animal Diversity-I	Animal Diversity-I
2	Animal Diversity-II	Animal Diversity-II
3	Comparative Anatomy of Vertebrates	Comparative Anatomy of Vertebrates
4	Developmental Biology of Vertebrates	Developmental Biology of Vertebrates
	Practical Course	Practical Course

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)

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)**.

• **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.

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 (40- UA and 10-CA)
VI	Principles of Ecology	50 (40- UA and 10-CA)

Semester- IV (Theory)

Paper	Title	Marks
VII	Fundamentals of Biochemistry	50 (40- UA and 10-CA)
VIII	Physiology-Control & Coordination	50 (40- UA and 10-CA)

PRACTICALS

PRACTICAL	Title	Marks
I	Cell Biology & Principles of Ecology	50 (40- UA and 10-CA)
II	Fundamentals of Biochemistry & Physiology Control & Coordination	50 (40- UA and 10-CA)
	Total Marks	100 (80-UA + 20-CA)

PAH SOLAPUR UNIVERSITY, SOLAPUR
Choice Based Credit System (CBCS)
Zoology

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) **

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) **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: ***i) Members of Grass land ecosystem –*** Grasshopper, Rat Snake, Grass, Herbs, Shrubs, Weeds, Trees, Vulture, Squirrel, Earthworm, Centipede, Scorpion , Rabbit and Indian Bustard. **OR** ***ii) Members of Pond ecosystem –*** 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) 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): Fundamentals of Biochemistry and Animal Physiology: Controlling and Coordinating Systems		
Questions		Marks
Q-1:	Qualitative tests of functional groups in carbohydrates, proteins and lipids. Or Estimation of protein and carbohydrates by colorimetric method.	08
Q-2:	Action of amylase or papain enzyme under optimum conditions **Or** Effect of pH, temperature and inhibitors on the action of amylase. **Or** Study of ABO blood group system and blood group antigens	08
Q:3:	Recording of simple muscle twitch demonstration. / Cardiogram (Virtual frog) **Or** 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). **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-2022
'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Mathematics (GE)

Name of the Course: B.Sc. I Sem. I & II (Liberal Science)

(Syllabus to be implemented from June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Generic Elective: MATHEMATICS (Paper-I) Discrete Mathematics

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 2 Credits	**UA – 40 Marks**
Practical – 4 Hours/week, 4 Credit	**CIE – 10 Marks**

About Course: This course is structured to emphasize the development of mathematical skills in Discrete Mathematics.

Course Prerequisite:
Student shall have knowledge of Mathematics.

Preamble:

Mathematics is an indispensable tool for much of science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought.

The mathematics program aims to provide a foundation for pursuing research in Mathematics as well as to provide essential quantitative skills to those interested in related fields. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences.

Course Objectives:

1. The course introduces set theory, permutations and combinations and counting principles.
2. One can learn the concepts of lattices and Boolean algebra in analysis of various applications.

Course Outcomes: This course will enable the students to:

1. Construct logical arguments and rigorous proofs.
2. Understand the basic principles of set theory, lattices and Boolean algebra.

3. Understand the ideas of mathematical induction and basic counting techniques.

Unit 1 A: Logical Mathematics – I **(8)**

Set theory, Operation on sets, Types of binary relations, Equivalence relations, Congruence and its properties, Partial and total ordering, Lattices, Properties of integers

Unit 1 B: Logical Mathematics – II **(7)**

Fundamental Theorem of Arithmetic, Division algorithm, Divisibility and Euclidean algorithm, GCD, LCM, Relatively prime.

Unit 2 A: Applications of Numbers **(8)**

Prime numbers, Statement of fundamental theorem of arithmetic, Fermat primes, Mathematical induction, Recursive relations and its solution (characteristics polynomial and generating function), Principles of counting (inclusion/exclusion, pigeon-hole), Permutation and combinations (with and without repetition).

Unit 2 B: Lattices and its Properties **(7)**

Duality principle, Lattices as ordered sets, Lattices as algebraic structures, Sub lattices, Products and homomorphism, Distributive lattices, Boolean algebras,

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- **Continuous Internal Evaluation (CIE):**

CIE will consist of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**

  1. Davey, B A., & Priestley, H. A. (2002). *Introduction to Lattices and Order* (2nd ed.). Cambridge University Press. Cambridge. 7th Printing 2012.
  2. Goodaire, Edgar G., & Parmenter, Michael M. (2003). *Discrete Mathematics with Graph Theory* (2nd ed.). Pearson Education (Singapore) Pte. Ltd. Indian Reprint.
  3. Lidl, Rudolf & Pilz, Günter. (1998). *Applied Abstract Algebra* (2nd ed.). Undergraduate Texts in Mathematics. Springer (SIE). Indian Reprint 2004.

- **Reference Books:**

  1. Kenneth Rosen Discrete Mathematics and its applications Mc Graw Hill Education 7^{th}edition.
  2. V Krishna Murthy, V. P. Mainra, J. L. Arora, An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-I

Generic Elective: MATHEMATICS (Paper-II) FOURIER SERIES

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 2 Credits	**UA – 40 Marks**
Practical – 4 Hours/week, 4 Credit	**CIE – 10 Marks**

About Course: This course is structured to emphasize the development of mathematical skills in Fourier Series.

Course Prerequisite:
Student shall have knowledge of Mathematics.

Preamble:

Mathematics is an indispensable tool for much of science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought.

The Mathematics program aims to provide a foundation for pursuing research in Mathematics as well as to provide essential quantitative skills to those interested in related fields. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences.

Course Objectives:

1. The aim of the course is to offer introduction to the concepts of Fourier series
2. Learn to use Fourier series to represent periodical physical phenomena in engineering analysis.

Course Outcomes: This course will enable the students to:

1. To understand the concepts of Fourier series.
2. To solve the problems based on Fourier series.

Unit 1: Fourier Series - I **(15)**

Fourier series, Theorems, Dirichlet's conditions, Fourier series for even and odd functions.

Unit 2: Fourier Series - II **(15)**

Half range Fourier series, other forms of Fourier series.

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**

1. Dr. S. Sreenadh, S. Ranganatham, Dr. M.V.S.S.N. Prasad, Dr. V. Ramesh Babu, FOURIER SERIES AND INTEGRAL TRANSFORMS, S. Chand and Company Pvt. Ltd., first edition 2014.

- **Reference Books:**

1. Integral Transform by Vasistha A. R., Gupta R. K., Krishna Prakashan Media Pvt. Ltd. 11, Shivaji Road, Meerut India.
2. Dr. J. R. Goyal and K. P. Gupta Integral Transform Pragati prakashan Meerut.
3. An Introduction to Laplace Transform and Fourier series by Phill Dyke, Springer publication.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-II

Generic Elective: MATHEMATICS (Paper-III) REAL ANALYSIS

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 2 Credits	**UA – 40 Marks**
Practical – 4 Hours/week, 4 Credit	**CIE – 10 Marks**

About Course: This course is structured to emphasize the development of mathematical skills in Real Analysis.

Course Prerequisite:
Student shall have knowledge of Mathematics.

Preamble:

Mathematics is an indispensable tool for much of science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought.

The mathematics program aims to provide a foundation for pursuing research in Mathematics as well as to provide essential quantitative skills to those interested in related fields. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences.

Course Objectives: The objective of the course is to have

1. The knowledge on basic properties of the field of real numbers, studying Bolzano-Weierstrass Theorem, sequences and convergence of sequences, series of real numbers and its convergence etc.

2. One of the core courses essential to start doing mathematics.

Course Outcomes: On completion of this course, students will be able to

1. Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
2. Handle fundamental properties of the real numbers that lead to the formal development of real analysis and understand limits and their use in sequences, series, differentiation and integration.

Unit 1: The Real Numbers – I **(15)**

Sets and functions, Mathematical Induction, Finite and Infinite Sets, The Algebraic and Order Properties of *R*, s-neighborhood of a point in *R*, Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets, Application of Supremum Property.

Unit 2: The Real Numbers – II **(15)**

The Completeness Property of *R*, The Archimedean Property, Density of Rational (and Irrational) numbers in *R*, Intervals, Absolute Value and the Real Line, Limit points of a set, Illustrations of Bolzano-Weierstrass theorem for sets, closure, interior and boundary of a set, Cantor's theorem.

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**
  1. R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis(3^{rd} Edition), John Wiley andSons (Asia) Pvt. Ltd., Singapore,2002.
  2. G. Das and S. Pattanayak, Fundamentals of Mathematical Analysis, TMH Publishing Co.

- **Reference Books:**
  1. S.C. Mallik and S. Arora-Mathematical Analysis, New Age International Publications.
  2. A.Kumar, S. Kumaresan, *A basic course in Real Analysis*, CRC Press, 2014.
  3. A Course of Mathematical Analysis by Shanti Narayan, S. Chand and company, New Delhi.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B. Sc. First Year (Liberal Science)

Semester-II

Generic Elective: MATHEMATICS (Paper-IV) Numerical Methods

Teaching Scheme:	**Examination Scheme:**
Lectures – 3 Hours/week, 2 Credits	**UA – 40 Marks**
Practical – 4 Hours/week, 4 Credit	**CIE – 10 Marks**

About Course: This course is structured to emphasize the development of mathematical skills in Numerical Methods.

Course Prerequisite:
Student shall have knowledge of Mathematics.

Preamble:

Mathematics is an indispensable tool for much of science and engineering. It provides the basic language for understanding the world and lends precision to scientific thought.

The Mathematics program aims to provide a foundation for pursuing research in Mathematics as well as to provide essential quantitative skills to those interested in related fields. With the maturing of the Indian industry, there is a large demand for people with strong analytical skills and broad-based background in the mathematical sciences.

Course Objectives:

1. To acquaint students' various topics in Numerical Analysis such as solutions of nonlinear equations in one variable, interpolation and approximation,
2. Numerical solution of ordinary differential equations using Computer Algebra System (CAS).

Course Outcomes: After completion of this course, students will be able to:

1. Find the consequences of finite precision and the inherent limits of numerical methods.
2. Solve first order initial value problems of ODE's numerically using Euler methods.
3. Appropriate numerical methods to solve algebraic and transcendental equations.

Unit 1: Algebraic Linear Systems and Interpolation-I **(15)**

Bisection method, Secant method, Regula-Falsi method, Newton-Raphson method. Gaussian elimination method (with row pivoting), Gauss-Jordan method; Iterative methods**:** Jacobi method, Gauss-Seidel method.

Unit 2: Algebraic Linear Systems and Interpolation-II **(15)**

Interpolation**:** Lagrange form, Newton form, Finite difference operators, Gregory-Newton forward and backward difference interpolations, Piecewise polynomial interpolation (linear and quadratic), Ordinary differential equation**:** Euler's method, Modified Euler's methods **(**Heun's and midpoint).

- **Continuous Internal Evaluation (CIE):**

CIE will consists of Home Assignment/Tutorials/Tests/Seminars, etc.

- **Text Books:**

1. Numerical Analysis and Programming in C by Pundir and Pundir (Pragati Prakashan)

2. Reference Books:

1. Chapra, Steven C. (2018). *Applied Numerical Methods with* MATLAB *for Engineers and* Scientists (4th ed.). McGraw-Hill Education.
2. Fausett, Laurene V. (2009). *Applied Numerical Analysis Using* MATLAB.Pearson. India.
3. Jain, M. K., Iyengar, S. R. K., & Jain R. K. (2012). *Numerical Methods for Scientific and Engineering Computation* (6th ed.). New Age International Publishers. Delhi.

PRACTICAL (GENERIC ELECTIVE)
B. Sc. First Year (Liberal Science)
Semester-I & II

Practical – I: MATHEMATICS

Teaching Scheme:
Practical – 4 Hours/week, 4 Credit

Examination Scheme:
UA – 80 Marks
CIE – 20 Marks

List of Practicals:

(Minimum 20 Maximum 25)

Students should perform minimum 20 practical during Semester I & II

Assignment No.1: Logical Mathematics – I (Set theory, Operation on sets, Types of binary relations, Equivalence relations,)
Assignment No.2: Partial and total ordering, Lattices, Properties of integers, Congruence and its properties
Assignment No.3: Logical Mathematics – I (Division algorithm, Divisibility and Euclidean algorithm, GCD, LCM, Relatively prime.)
Assignment No.4: Logical Mathematics – I (Principle of counting (inclusion/exclusion, pigeon-hole), Permutation and combinations (with and without repetition))
Assignment No.5: Lattices and its Properties
Assignment No.6: Examples on Fourier Series of function.
Assignment No.7: Examples on functions having point of discontinuity
Assignment No.8: Examples on Fourier series for Even and Odd functions.
Assignment No.9: Examples on Half range series
Assignment No.10: Examples on Fourier series for functions having period $2l$
Assignment No.11: The Real Numbers - I (Sets and functions, Mathematical Induction, Finite and Infinite Sets)
Assignment No.12: The Real Numbers - I (Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets, Application of Supremum Property.
Assignment No.13: The Real Numbers – II **(**Intervals, Limit points of a set, closure, interior and Boundary of a set.)
Assignment No.14: The Real Numbers – II (Order Properties of R and Absolute value and the real line)
Assignment No.15: Bisection method, Secant method.
Assignment No.16: Regula-Falsi method, Newton-Raphson method.
Assignment No.17: Gaussian elimination method, Gauss-Jordan method.
Assignment No.18: Iterative methods**:** Jacobi method, Gauss-Seidel method;.
Assignment No.19: Interpolation**: (**Lagrange form, Newton form, Finite difference operators, Gregory-Newton forward and backward difference interpolations)

Assignment No.20: Piecewise polynomial interpolation (linear and quadratic), Ordinary differential equation**:** Euler's method,

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-2022

'B++' Grade (CGPA 2.96)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Physics

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

(Syllabus to be implemented from June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I, PHYSICS

Preamble:

The systematic and planned curricula for first year students shall motivate and encourage them for pursuing higher studies in Physics and for becoming an entrepreneur.

Objectives:

• To provide knowledge of scientific and technological aspects of Physics.

• To familiarize with current and recent scientific and technological developments.

• To enrich knowledge through problem solving, hands on activities, study visits, projects etc.

• To create foundation for research and development in Physics.

• To help students build-up a progressive and successful career in Physics

Eligibility:

1. First Year B.Sc.: Higher Secondary School Certificate (10+2) Science stream or its equivalent Examination as per the Punyashlok Ahilyadevi Holkar Solapur University, Solapur eligibility norms.
2. Reservation and relaxation will be as per the Government rules.

B. Sc. I Physics

Equivalent Subjects/Papers for OLD Syllabus (w.e.f. June 2022)

Sr. No.	Name of OLD Paper wef- 2019	Name of the New Paper wef- 2022
1.	Mechanics and Properties of Matter	Mechanics and Properties of Matter
2.	Optics and Laser	Optics
3.	Heat and Thermodynamics	Heat and Thermodynamics
4.	Electricity, Magnetism and Basic Electronics	Electricity, Magnetism and Basic Electronics

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 2022)

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.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I Semester I

Core Paper- DSC 1A, Physics Paper: I

Title of the paper: MECHANICS AND PROPERTIES OF MATTER

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

==========

Unit- I

1. Moment of Inertia (5)

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

2. Pendulums and Oscillations (6)

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

Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations, problems.

3. Elasticity (7)

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

Hook's law and coefficient of elasticity, Young's modulus, Bulk modulus and Modulus of rigidity, Work done during longitudinal strain, volume strain, and shearing strain, Poisson's ratio, Relation between three elastic moduli (Y, η, K), Determination of Y of rectangular thin bar loaded at the centre, Torsional oscillations, Rigidity of a wire by torsional oscillations, problems

Unit- II

4. Surface Tension (6)

Review of S.T., Angle of contact and wettability, Capillary Rise Method, 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, problems.

5. Viscosity and Fluid dynamics (6)

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, problems.

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

5) Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.

6) Concepts of Physics: H.C. Varma, Bharati Bhavan Publishers

Learning Outcomes:

On successful completion of this course students will be able to do the following:

1. Understanding the concept of Moment of Inertia and applying them in calculations of the moment of inertia of various systems.
2. Understand the physics and mathematics of oscillations and to solve the equations of motion for simple harmonic and damped oscillators
3. Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them.
4. Understand the concepts of elasticity and be able to perform calculations using them.
5. Understand the concepts of surface tension and viscosity and be able to perform calculations using them.
6. Understand the concepts of viscosity & fluid dynamics and its application in real life problems.
7. Demonstrate quantitative problem solving skills in all the topics covered.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I Semester I

Core Paper- DSC 1A, Physics Paper: II

Title of the paper: OPTICS

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit- I:

1: Geometrical Optics and Aberrations (7)

Introduction, Fermat's Principle, Deduction of law of reflection by Fermat's Principle, Types of lenses, Chromatic and spherical aberrations, Methods to minimize chromatic and spherical aberrations, Problems

2: Optical Instruments (5)

Introduction, Types of eye-pieces, Ramsden eye piece, Huygens eye-piece, Comparison between Ramsden and Huygens eye-piece, Spectrometer and optical bench (Construction, working and applications), Problems

3: Interference (6)

Introduction, Interference of light by division of amplitude, Interference in parallel faced thin film (reflected only), Wedge shaped thin film, Newton's rings and its applications, Problems

Unit- II:

4: Diffraction (7)

Introduction, Types of diffraction, Distinguish between Fresnel and Fraunhoffer diffraction, Schuster's method, Plane diffraction grating, Comparison between prism and grating spectra, Determination of wavelength of light using diffraction grating, Distinguish between interference and diffraction, problems

5: Laser **(5)**

Introduction, Three quantum processes, Einstein Coefficients, Population inversion, Metastable state, Important components of laser, Types of laser, He-Ne and Ruby laser, Properties and applications of laser, Problems.

Reference Books:

1. Ray Optics by R. K. Verma

2. Text book of Optics (new edition) Brijlal and Subramanyam

3. Optics 2nd edition – Ajay Ghatak TataMcGrew Hill

4. Concept of Physics – H. C. Verma

6. Optics by Murugeshan, S. Chand & Co.

7. Introduction to laser by Avadhanulu, S. Chand & Co.

Course Outcomes:

On successful completion of this course student will be able to:

- ✓ Understand technical applications of simple optical instruments.
- ✓ Understand and explain the different optical method of testing and measuring of various physical parameters
- ✓ Understand Fermat's principle, explain about different aberrations in lenses and discuss the method to minimize them.
- ✓ Understand the types of eyepieces and construction and working of spectrometer and optical bench for determining various optical values.
- ✓ Understand the phenomenon of interference of light and its formation in thin film, Newton's ring, wedge shaped film etc. due to division of amplitude.
- ✓ Explain Schuster method, Distinguish between diffraction and interference patterns, prism and grating spectra
- ✓ Comprehended the basic principle of laser and its parts, the construction and working of He-Ne and Ruby laser.
- ✓ Solve problems using suitable assumptions and formulae as well as able to assess the results.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I Semester II

Core Paper- DSC 1B, Physics Paper: III

Title of the paper: HEAT AND THERMODYNAMICS

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit- I

1. Transport Phenomenon (6)

Introduction, mean free path, Clausius expression for mean free path (mutual collision cross section approximate method), Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure, Diffusion (without derivation) Problems

2. Liquefaction of Gases (6)

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-II, Problems.

3. Thermodynamics (6)

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, Problems

Unit- II

4. Heat engines (6)

Introduction, Heat engine, Carnot's heat engine and its efficiency, Otto cycle and its efficiency Diesel cycle and its efficiency, Comparison between Otto and Diesel engine, Problems

5. Refrigerator **(6)**

Introduction, Refrigeration Cycle, Coefficient of performance of refrigerator, Vapor compression Refrigerator, Air conditioning (principle and applications), Problems

Reference books:

1. Treatise on heat – Saha & Shrivastav

2. Kinetic theory of gases – V.N. Kelkar

3. Heat and Thermodynamics – Brijlal & Subrahmanyam

Learning Outcomes:

After successfully completing this course, the student will be able to do the following:

1. Determination of Coefficient of Viscosity, Thermal Conductivity and Diffusion.

2. Understand Liquefaction of gases by various methods and Properties of Liquid He-II.

3. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process.

4. Analyse the heat engines and calculate thermal efficiency.

5. Analyze the refrigerators and calculate coefficient of performance.

6. Understand property ‘entropy’ and derive some thermo dynamical relations using entropy concept.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I Semester II

Core Paper- DSC 1B, Physics Paper: IV

Title of the paper: ELECTRICITY, MAGNETISM AND BASIC ELECTRONICS

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit I

1. Varying Current: (6)

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

2. A.C. Circuits: (6)

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, Owen's bridge, Problems.

3. Magnetostatics and Ballistic Galvanometer: (6)

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 BG, Problems.

Unit II

4. Electronic Devices: (6)

Introduction, Rectifiers, Bridge rectifier with π-filter, Clippers, Clampers, Zener diode and its application as a voltage regulator, Problems.

5. Bi-Junction Transistor (BJT): **(6)**

Introduction, Construction and working of transistor, Input-output and transfer characteristics of CE & CB mode, Relation between α and β. Transistor as amplifier - CE mode, Problems.

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

Learning Outcomes: On successful completion of this course students

1. Understand the concept of Varying Current and applying them in charging and discharging of capacitor and time constant.

2. Understand the concept of AC circuits and different AC bridges.

3. Understand the concepts Magnetostatics and applying then to determine magnetic induction and also understand Ballistic Galvanometer theory and its constants.

4. Understand the rectifiers specially Bridge rectifier with filters also different wave shaping circuits.

5. Understand BJT include its output characteristics under CE and CB mode with application of transistor amplifier.

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

(Total Credits: 4, Contact hrs: 4 hrs per week) **Marks: 100 (UA-80 + CA-20)**

Group I – General Physics and Heat

1. L C of various measuring instruments and instrumental zero errors of each Instrument and its correction for more accuracy in the measurements.
2. Bar pendulum
3. Bifilar pendulum
4. Torsional pendulum
5. Moment of Inertia of disc by annular ring
6. Poisson's ratio
7. Surface Tension by liquid drop 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

Group II – Electricity, Electronics, and Optics

1. Use of Spectrometer to determine Angle of prism
2. Dispersive power of prism
3. Diffraction grating to determine its grating element
4. To determine wavelength of LASER beam by using diffraction grating/ Divergence of LASER beam

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 π filter - β & γ
8. Out Put Characteristics Transistor amplifier in CE mode: determination of β)
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. Colour code of resistors and measurement of capacitors; identification of their values.

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-2022

'B^{++}' Grade (CGPA 2.96)

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 June 2023)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

B. Sc. Part – II
Core Subject: - Physics

(CBCS Semester Pattern) syllabus w.e.f. June 2023)

Programme Outcomes:

1. To understand the basic laws and explore the fundamental concepts of physics.

2. To understand the concepts and significance of the various physical phenomena.

3. To carry out experiments to understand the laws and concepts of physics.

4. To apply the theories learnt and the skills acquired to solve real time problems.

5. To acquire a wide range of problem solving skills, both analytical and technical and to apply them.

6. To enhance the student's academic abilities, personal qualities and transferable skills this will give them an opportunity to develop as responsible citizens.

7. To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community.

Marks and Credits Distribution System

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 papers

Semester - III			
Paper No.	**Paper Name**	**Total marks**	**Scheme of marking**
V	General Physics and Sound	50	80% (UA) + 20% (CA)
VI	Electronic Devices and Applications	50	80% (UA) + 20% (CA)
Semester - IV			
VII	Geometrical, Physical and Fiber Optics	50	80% (UA) + 20% (CA)
VII	Modern Physics	50	80% (UA) + 20% (CA)
Practical			
At the end of Fourth Semester		100	80% (UA) + 20% (CA)

UA (University Assessment): Four groups each of 15 marks, 10 marks for Journal 10 marks for Educational tour/Industrial visit/Seminar or Conference attendance/Project report
CA (College Assessment): 20 Marks

Equivalent Subject for Old Syllabus

Sr. No.	Paper No.	Name of the OLD paper	Name of the NEW paper
1.	V	General Physics and Heat	General Physics and Sound
2.	VI	Electronics	Electronic Devices and Applications
3.	VII	Optics	Geometrical, Physical and Fiber Optics
4.	VIII	Modern Physics	Modern Physics

B.Sc. II

Semester III

General Physics and Sound

Core Paper	**Paper No.**	**Theory**	**Marks**	**Credit**
DSC 1C	V	30	50 (UA 40 + CA 10)	2

Course Objective:

1. To apply scientific and technical knowledge and skills of physics to other areas of a study.
2. To realize basic concepts, principles, laws and the theories related to various scientific phenomena.
3. To apply theories and solve problems faced in real life.

Course Outcomes:

After completion of the course the students

1. Understand vector analysis, differential operators and their physical significance.
2. Understand the concepts of precession, nutation and its applications.
3. Understand the concept of elasticity and its relevance.
4. Understand the concept of viscosity and different viscometer.
5. Illustrate concept of acoustics and its applications.
6. Develop problem solving skills and able to assess the results.

Unit - I		
Sr. No.	***Name of the chapter***	***Contact hrs.***
	1. Vectors	6
1.1	Scalar and vector triple product	
1.2	Scalar and vector fields	
1.3	Del operator	
1.4	Divergence of a vector and their physical significance	
1.5	Curl of vector and their significance	
1.6	Problems	
	2. Precessional Motion	6
2.1	Precession	
2.2	Gyroscope	
2.3	Nutation	
2.4	Lanchester's rule	
2.5	Gyrostatic pendulum	
2.6	Motion of rolling disc	
2.7	Gyroscopic applications in brief	
2.8	Problems	
	3. Elasticity	6
3.1	Bending of a beam	
3.2	Bending moment	

3.3	Centrally loaded beam	
3.5	Y and η by Searle's method	
3.6	Problems	
Unit – II		
	4. Viscosity	6
4.1	Motion in a viscosity medium – Stroke'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 Method	
4.6	Problems	
	5. Sound	6
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	
5.4	Sabine's formula	
5.5	Problems	

Reference Books:

Sr. No.	Name of the book	Author/s
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

B.Sc. II

Semester III

Electronic Devices and Applications

Core Paper	**Paper No.**	**Theory**	**Marks**	**Credit**
DSC 1C	VI	30	50 (UA 40 + CA 10)	2

Course Objective:

1. The objective of this course is to introduce students to the basic knowledge of semiconductor devices and Digital Electronics, their practical applications.
2. This course mainly introduces basic electronic devices namely Transistor's amplifiers, Oscillators, Cathode Ray Oscilloscope, Field effect transistors (FETs) and Unijunction transistor (UJT).

Course Outcomes:

After completion of the course the students
1. Understand the basic theory and operation of semiconductor devices used for its circuit applications.
2. Understand the basic circuit concepts and responses.
3. Get hands-on on various electronic circuits and instruments.
4. Get expose to electronics technologies.

Unit - I		
Sr. No.	***Name of the chapter***	***Contact hrs.***
	1. Transistor amplifier	**7**
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	
1.10	Problems	
	2. Oscillator	**6**
2.1	Types of waveforms	
2.2	Oscillations from tank circuit	
2.3	Barkhausen 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	
2.9	Problems	

	3. Unipolar Device	5
3.1	FET: Construction, operation, parameters and characteristics	
3.2	Application of FET as VVR	
3.3	UJT: Construction, operation and characteristics	
3.4	UJT as voltage sweep generator	
3.5	Problems	
	Unit – II	
	4. Digital Electronics	6
4.1	Binary number systems and operations	
4.2	De Morgan's theorems	
4.3	Half adder	
4.4	Full adder	
4.5	RS flip flop	
4.6	JK flip flop.	
4.7	Problems	
	5. Electronic Instruments	6
5.1	Principle, construction and working of CRT	
5.2	Block diagram of CRO	
5.3	Uses of CRO	
5.4	Digital multimeter (DMM) and its applications	
5.5	Regulated power supply – 1. Transistor series voltage regulator 2. IC voltage regulator	
5.6	Problems	

Reference Books:

Sr. No.	Name of the book	Author/s
1	Principles of electronics	V.K. Mehta
2	Electronics principles	Malvino
3	Op-Amps and linear integrated circuits	Ramakant Gayakwad
4	A Text book of Electrical Technology Vol. IV	B.L. Theraja, A.K. Theraja
5	Electronic Devices and Circuits, An introduction	Allen Mottershed
6	Basic Electronics & Linear Circuits	N.N Bhargava, D.C. Kulshreshta, S.C. Gupta.
7	Digital Principles and Applications	Malvino and Leach
8	Electronic Devices and Circuits	Jacob Milman & Chrstes S Halkias

B.Sc. II

Semester IV

Geometrical, Physical and Fiber Optics

Core Paper	Paper No.	Theory	Marks	Credit
DSC 2C	VII	30	50 (UA 40 + CA 10)	2

Course Objective:

1. To apply skills of geometrical, physical and fiber optics to other areas of a study.

2. To apply theories and solve problems faced in real life.

3. To perform the experiments as a) Goniometer for equivalent focal length b) Diffraction at single slit c) Resolving power of grating d) Optical activity by polarimeter

Course Outcomes:

After completion of the course the students

1. Understand the cardinal points of lens system
2. Understand the phenomenon of interference of light. Michelson's interferometer and F-P interferometer and its applications
3. Understand phenomenon of diffraction of light and use of zone plate
4. Understand concept of resolving power and find R.P of prism and grating
5. Understand polarization, optically active substance and its use in polarimeter
6. Understand of optical fiber and its use in communication system

Unit - I		
Sr. No.	***Name of the chapter***	***Contact hrs.***
	1. Cardinal points	**6**
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	Combination of two thin lenses separated by finite distance	
1.7	Problems	
	2. Interference of light	**5**
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	Fabry Perot interferometer	
2.4	Superiority of F.P. interferometer over Michelson's interferometer	
2.5	Problems	

	3. ***Diffraction of light & resolving power***	7
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	Modified Rayleigh's criterion	
3.8	R.P. of plane diffraction grating	
3.9	R. P. of prism	
3.10	Problems	
	Unit - II	
	4. ***Polarization***	7
4.1	Concept of polarization	
4.2	Double refraction	
4.3	Huygen's explanation of double refraction through uni-axial crystals	
4.4	Nicol's prism and 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	Polarimeter experiment	
4.9	Problems	
	5. ***Optical Fibers***	5
5.1	Structure of fibers	
5.2	Types of optical fiber	
5.3	Numerical aperture	
5.4	Step index fiber and graded index fiber	
5.5	Fiber optic communication system	
5.6	Advantages of optical fiber	
5.7	Problems	

Reference Books:

Sr. No.	Name of the book	Author/s
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

B.Sc. II

Semester IV

Modern Physics

Core Paper	Paper No.	Theory	Marks	Credit
DSC 2C	VIII	30	50 (UA 40 + CA 10)	2

Course Objective:

1) To provide an understanding of physical concepts and theories of modern physics.
2) To provide an advance description of nature through new theories different from classical description.
3) To introduce the special theory of relativity, wave-particle duality and atomic physics.
4) To introduce production of X-rays and their applications.

Course Outcomes:

After completion of the course the students
1) Understanding of modern theories and evolution of physics from classical to its modern era.
2) Understand the intuitive ideas of the relativity.
3) Understand the nature of light in the form wave-particle duality.
4) Describe crystal structure with X-ray diffraction.

Unit - I		
Sr. No.	***Name of the chapter***	***Contact hrs.***
	1. The Special Theory of Relativity	8
1.1	Introduction	
1.2	Inertial and Non-Inertial frame of reference	
1.3	Galilean transformation	
1.4	Ether hypothesis	
1.5	Michelson-Morley experiment	
1.6	Einstein's postulates of special relativity	
1.7	Lorentz transformation	
1.8	Variation of length with velocity	
1.9	Variation of time with velocity	
1.10	Variation of mass with velocity	
1.11	Twin paradox	
1.12	Mass energy relation	
1.13	Problems	
	2. Matter Waves	6
2.1	De-Broglie's hypothesis of matter waves	
2.2	De-Broglie's wavelength - in terms of momentum, temperature and P.D./K.E.	
2.3	Particle velocity, group velocity, phase velocity and their inter-relationship	

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	
2.7	Problems	
	3. Vector atom model	8
3.1	Space quantization	
3.2	Spin hypothesis	
3.3	Stern-Gerlach experiment	
3.4	Quantum number associated with vector atom model	
3.5	Pauli's exclusion principle	
3.6	Spin orbital 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	Problems	
	Unit - II	
	4. Compton effect	3
4.1	Compton Effect	
4.2	Expression for change in wavelength for scattered photon	
4.3	Experimental verification of Compton effect	
4.4	Problems	
	5. X-rays	5
5.1	X-ray production by Coolidge tube : principal, construction and working	
5.2	Properties and characteristics of X-rays	
5.3	Continuous and Characteristic X-rays spectrum	
5.4	Bragg's Law	
5.5	Applications of X-rays in various fields	
5.6	Problems	

Reference Books:

Sr. No.	Name of the book	Author/s
1	Introduction to special relativity	Robert Resnik
2	Special relativity for beginners: A textbook for undergraduates	Jürgen Freund
3	Modern Physics 13th edition	R. Murugeshan and K. Sivaprasath
4	Elements of Modern Physics	S. H. Patil
5	Modern Physics (For B.E., B.Tech., B.Sc. and A.M.I.E students)	B. L.Theraja
6	Modern Physics 3rd edition	R. Serway, C. Moses and C. Moyer
7	Atomic Physics [Modern Physics] (For M.Sc. and B.Sc. Students)	S. N. Ghoshal

B.Sc. II (Physics)

Practical

Core Paper	Marks	Credit
DSC 2C	100 (80 UA+ 20 CA)	4

Course Outcomes:

After completion of the course the students

1) Understands the methods of experimental physics.

2) Emphasis on different laboratory techniques specially the importance of accuracy of measurements.

3) Providing a hands-on learning experience in measuring the basic concepts, properties of matter, heat , optics, electricity. electronics and modern physics.

List of Experiments

Group I (General Physics, Heat and Sound)

Sr. No.	Name of the experiments
1	Young's Modulus (Y) by bending of the centrally loaded beam
2	Y or η of the material 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 by Lees's method
9	Velocity of sound in air by Kundt's tube
10	Velocity of sound in air by resonating bottle

Group II (Electronics)

Sr. No.	Name of the experiments
1	Transistor series voltage regulator
2	Voltage divider bias
3	Use of C.R.O. for measurement of unknown AC voltage, DC voltage and frequency
4	Characteristics of FET
5	Coplitt's Oscillator
6	Phase shift Oscillator
7	DeMorgan's Theorems
8	Two Stage RC Coupled Amplifier
9	Construction of half adder and full adder using gates
10	UJT as voltage sweep generator

Group III (Optics)

Sr. No.	Name of the experiments
1	Biprism: To determine the wavelength of monochromatic light
2	Goniometer : equivalent focal length of thin 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 straight edge
10	Wedge shaped film: Measurement of thickness
	Group IV (Electricity, Magnetism and Modern Physics)
Sr. No.	**Name of the experiments**
1	Constants of B.G.
2	Comparison of Capacities by De Sauty's bridge
3	Mutual Inductance of coils
4	Low resistance by Carry Foster method
5	High resistance by nearly equal deflection method
6	Solar cell characteristics to determine fill factor and efficiency
7	Impedance of LCR circuit
8	Sharpness of series resonance circuit
9	Study of characteristics of G-M tube and determination of its operating voltage, Plateau length and slopes.
10	Verification of inverse square law for gamma rays

Note:

- At least eight experiments from each group are required to certify the journal.
- 10 Marks for certified journal
- 10 Marks 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 University practical examination of 80 marks.

Hemuji Chandele College, Shelgaon R

Workload Distribution

Name of the faculty : BACHUTE R.S.

Department of Chemistry

Academic year 2022-23

Sr. No.	Class	Sem	Student strength	Paper no & paper name	Hours/week
1	B.Sc I	I	80	Paper -I physical chemistry	3
2	B.Sc II	IV	30	Paper – VII physical chemistry	3
3	B.Sc III	V	40	Paper – IX physical chemistry	6
4	B.SC III	V	40	Paper – XII analytical chemistry	6
5	B.SC III	VI	40	Paper – XIII physical chemistry	6
6	B.SC III	VI	40	Paper – XVI Analytical chemistry	6
				Total	30

Sign of faculty

HOD
Dept.of Chemistry

PRINCIPAL
Hemuji Chandele College Shelgao
Tal-Barshi, Dist-Solapur
principal

Hemuji Chandele College, Shelgaon R

Workload Distribution

Name of the faculty : GAIKWAD M.S.

Department of Chemistry

Academic year 2022-23

Sr. No.	Class	Sem	Student strength	Paper no & paper name	Hours/week
1	B.Sc I	II	80	Paper - III Organic chemistry	3
2	B.sc I	II	80	Paper – IV analytical chemistry	3
3	B.Sc II	III	30	Paper – V Organic chemistry	3
4	B.Sc III	V	40	Paper – XI organic chemistry	6
5	B.SC III	VI	40	Paper – XV organic chemistry	6
				TOTAL	21

Hemuji Chandele College, Shelgaon R

Workload Distribution

Name of the faculty :JADHAV ..

Department of Chemistry

Academic year 2022-23

Sr. No.	Class	Sem	Student strength	Paper no & paper name	Hours/week
1	B.Sc I	I	80	Paper – II Inorganic chemistry	3
2	B.sc II	IV	30	Paper – VIII analytical chemistry	3
3	B.Sc II	III	30	Paper – VI INOrganic chemistry	3
4	B.Sc III	V	40	Paper – X INorganic chemistry	6
5	B.SC III	VI	40	Paper – XIV INorganic chemistry	6
				TOTAL	21

PRINCIPAL
Hemuji Chandele College Shelgaon (R
Tal-Barshi, Dist-Solapur

Sign of faculty

HOD
Dept.of Chemistry

principal

Hemuji Chandele College, Shelgaon R

Workload Distribution

Semester : first and second

Name of the faculty :Urade .P.N

Department of Microbiology

Academic year 2022-23

Sr. No.	Class	Student strength	subject	Hours/week
1	B.Sc. I	53	Cell cytology and Microbial technique	4
2	B.sc II	23	Bacterial cytology Physiology and Metabolism	4
3	B.Sc. III	7	Agriculture Microbiology	4
4	B.sc I	53	Microbial metabolism and cultivation	4
5	B.sc II	23	Introduction to industrial microbiology	4
6	B.sc III	7	Clinical Microbiology	4
			TOTAL	32

Head of the Department
Microbiology

HOD SING

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

PRINCIPAL SIGN

Hemuji Chandele College, Shelgaon R

Workload Distribution

Semester : first and second

Name of the faculty : Tambat .R .B

Department of Microbiology

Academic year 2022-23

Sr. No.	Class	Student strength	subject	Hours/week
1	B.Sc I	53	Introduction to microbiology and microbial diversity	4
2	B.sc II	23	Bacterial genetic	4
3	B.Sc III	7	Virology	4
4	B.sc I	53	Applied Microbiology	4
5	B.sc II	23	Immunology and Medical Microbiology	4
6	B.sc III	7	Microbial Genetic	4
			TOTAL	32

Head of the Department
Microbiology

HOD SING

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

PRINCIPAL SIGN

Hemuji Chandele College, Shelgaon R

Workload Distribution

Semester : first and second

Name of the faculty : Gavali .A

Department of Microbiology

Academic year 2022-23

Sr. No.	Class	Student strength	subject	Hours/week
1	B.Sc. III	7	Immunology	4
2	B.sc. III	7	Industrial microbiology	4
3	B.Sc. III	7	Environmental Microbiology	4
4	B.sc. III	7	Microbial Biochemistry	4
			TOTAL	32

Golare.

Head of the Department
Microbiology

HOD sign

Golare,

Principal
Hemuji Chandele College
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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Workload Distribution

Name of Faculty :-Surwase J.R.

Department of Computer Science

Academic year 2022-23

Sr. No	Class	Sem	Student Strength	Paper no and paper name	Hours /Week
1	B.Sc.-I	I		Paper I–Fundamentals of Computers	3
				Paper –II Programming Language using C	3
2	B.Sc.-I	II		Paper-III –Introduction to Web Designing	3
				Paper –IV Programming Language using C	3
3	B.Sc.-II	III		Paper V - Data Structures	3
				Paper VI -Software Engineering	3
				Paper VII - Core Java	3
				Paper VIII -DBMS Using Oracle	3
3	B.Sc.-III	V		Paper IX - Visual Programming Using C#	3
				Paper X -Core Java	3

				Paper XI - Operating System	3
				Paper XII –Python	3
		VI		Paper XIV- Web Technology	3
				Paper XV- Advanced Java	3
				Paper XVI-Data Communication and Networking	3
				Paper XVII Advance Python	3
				Paper XVIII Software Testing	3
				Total	51

NAME OF HOD

SIGN OF HOD

Golare
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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Workload Distribution

Name of Faculty : Patil m.m

Department of Botany
Academic year 2022-23

Sr. No	Class	Sem	Student Strength	Paper no and paper name	Hours /Week
1	B.Sc.-I	I		Paper I–Microbiology nd and Phycology	3
				Paper –II Fungi and Archegonote	3
2	B.Sc.-I	II		Paper-III – Plant ecology	3
				Paper –IV Taxonomy of Angiosperms	3
3	B.Sc.-II	III		Paper V – Plant Anatomy	3
				Paper VI -Plant Metabolism	3
4	Bsc-II	IV		Paper VII -Plant Physiology	3
				Paper VIII –Emryology of Agiosperms	3
				Total	24

NAME OF HOD – Patil M.M.

Madhuri

SIGN OF HOD

Head of the Department
Botany

Gojare.

SINGATURE OF PRINCIPAL

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Workload Distribution

Name of Faculty : Patil m.m

Department of Zoology
Academic year 2022-23

Sr. No	Class	Sem	Student Strength	Paper no and paper name	Hours /Week
1	B.Sc.-I	I		Paper I–Animal diversity -I	3
				Paper –II Animal diversity -II	3
2	B.Sc.-I	II		Paper-III – Comparative anatomy of vertebrates	3
				Paper –IV Developmental biology of vertebrates	3
3	B.Sc.-II	III		Paper V – Cell biology	3
				Paper VI -Principles of ecology	3
4	Bsc-II	IV		Paper VII - Fundamental biochemistry	3
				Paper VIII –Phisiology control and co-ordination	3
				Total	24

NAME OF HOD

Head of the Department
Zoology

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Hemuji Chandele College, Shelgaon R

Workload Distribution

Semester : first and second

Name of the faculty :

Department of Mathematics

Academic year 2022-23

Sr. No.	Class	Student strength	subject	Hours/week
1	B.Sc I	12	Algebra	4
			Calculus	4
2	B.Sc II	13	Differential Calculus	4
			Laplace Transform	4
3	B.Sc I	12	Geometry	4
			Differential Equation	4
4	B.Sc II	3	Differential Equation	4
			Abstract Algebra	4
			total	32

Rupali.
Sign of faculty

Rupali.
Head of the Department
Mathematics
HOD

Gotare.
PRINCIPAL
Hemuji Chandele College She
Tal-Barshi, Dist-Solap
principal

Hemuji Chandele College, Shelgaon R

Workload Distribution

Semester : first and second

Name of the faculty : Dindore P.A.

Department of physics

Academic year 2022-23

Sr. No.	Class	Student strength	subject	Hours/week
1	B.Sc I	12	Mechanics and properties of matter	4
			Optics and laser	4
2	B.Sc II	04	General physics, heat an d sound	4
			electronics	4
3	B.Sc I	12	Heat and thermodynamics	4
			Electricity, magnetism and basic electronics	4
4	B.Sc II	04	optics	4
			Modern physics	4
			total	32

Priyanka
Sign of faculty
Dindore P. A.

Priyanka
HOD
Dindore P. A.

Principal

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Class – B.Sc. I

Semester –First

Subject-Mathematics

Paper – Algebra

Paper - I

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Introduction and Definition of matrix	23/8/22	16	Lecture
Day2	Types of matrix and its examples	24/8/22	15	Lecture
Day3	Symmetric and skew symmetric matrix	25/08/22	12	Lecture
Day4	Assignment – Rank of matrix	26/8/22	10	Lecture
Day5	Minor and cofactors and elementary transformation of a matrix	28/8/22	15	Lecture
Day6	Rank of a matrix(echelon and normal form)	29/8/22	16	Lecture
Day7	MCQ-Matrix	31/8/22	15	Test
Day 8	Characteristic equation of a matri and its examples	1/8/22	14	Lecture
Day9	Assignment- Inverse of a matrix by caylay –hamilton method	11/8/22	12	Lecture
Day10	Caylay Hamilton theorem and its use in finding the inverse of matrix	12/8/22	12	Lecture
Day11	**Test- Algebra**	14/8/22	13	Test
Day12	Introduction of linear equation	15/8/22	15	Lecture
Day13	System of linear equation	17/8/22	16	Lecture
Day14	**System of homogeneous linear equation**	7/9/22	16	Lecture
Day15	Solution of system of linear homogeneous equation	8/9/22	16	Lecture
Day16	Assingment- solution of system of linear homogeneous equation	9/9/22	14	Lecture
Day17	System of homogeneous linear equation and its examples	14/9/22	12	Lecture
Day18	System of non- homogeneous linear equation	15/9/22	12	Lecture
Day19	Examples of non – homogeneous equation	16/9/22	12	Lecture
Day20	Assignment- solution of system of on homogeneous Linear equation	25/9/22	12	Lecture
Day21	Eigen value and eigen vectors and its examples	26/9/22	12	Lecture

Day22	Assignment eigenvalue and eigenvectors	27/9/22	12	Lecture
Day23	Introduction of complex number	6/10/22	10	Lecture
Day24	Definition of complexumberand itsexamples	7/10/22	11	Lecture
Day25	**Modulus and argument of complex number**	9/10/22	12	Lecture
Day26	MCQ-COMPLEX -1	13/10/22	11	Test
Day27	**Demoviers theorem**	14/10/22	11	Lecture
Day28	Demoivres theorem and its application	16/10/22	11	Lecture
Day29	Assignment-application of demovires theorem	20/10/22	10	Lecture
Day30	Roots ofunity of a complex number	21/10/22	10	Lecture
Day31	MCQ-Complexnumber	22/10/22	10	Test
Day32	**Roots of unity of complex number and its examples**	24/10/22	12	Lecture
Day33	**Test- complex number**	27/10/22	12	Test
Day34	**Expansion of cosnθ, sinnθ**	26/10/22	12	Lecture
Day35	**Introduction to transcendental theorem**	27/10/22	12	Lecture
Day36	**Periods ofcircular function**	28/10/22	12	Lecture
Day37	**Hyperbolic function**	29/10/22	12	Lecture
Day38	**MCQ-transcendental function**	31/10/22	12	Test
Day39	**Relation between circular and hyperbolicfunctions**	1/11/22	12	Lecture
Day40	**Period of hyperbolic function**	2/11/22	10	Lecture
Day41	**Assignment-Transcendental function**	3/11/22	11	Lecture
Day42	**Inverse circular function**	4/11/22	11	Lecture
Day43	**Inverse hyperbolic function**	5/11/22	11	Lecture
Day44	**Assignmrent of inverse hyperbolic function**	7/11/22	12	Practical

Name of HOD - Nagtilak Rupali

PRINCIPAL
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Signatuare of HOD-

Head of the Department
Mathematics

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

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Class – B.Sc. I

Semester –First

Subject-Mathematics

Paper – CALCULUS

Paper - II

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Inroduction of differentiation	23/8/22	16	Lecture
Day2	Indeterminate form	24/8/22	15	Lecture
Day3	L hospital rule	25/8/22	12	Lecture
Day4	MCQ-Differentiation	26/8/22	10	Test
Day5	L Hospitals rule and its differentiation	28/8/22	15	Lecture
Day6	The indeterminate form 0,1.∞	29/8/22	16	Lecture
Day7	Assignment- L hospitals rule	31/8/22	15	Lecture
Day 8	Successive differentiation	10/8/22	14	Lecture
Day9	Leibnitz theorem	11/8/22	12	Lecture
Day10	Test- Differentiation	12/8/22	12	Lecture
Day11	**Taylors theorem and machaurins theorem**	14/8/22	13	Lecture
Day12	Assignment – successive differentiation	16/8/22	15	Lecture
Day13	Introduction of two variable form	17/8/22	16	Lecture
Day14	**Limit and continuity of two variable function**	18/8/22	16	Lecture
Day15	Partial derivatives	19/8/22	16	Lecture
Day16	MCQ-Continuity of a function	20/8/22	14	Test
Day17	Partial Derivatives	22/8/22	12	Lecture
Day18	Assingment – Partial derivative of higher order	23/8/22	12	Lecture
Day19	Homogeneous function	24/8/22	12	Lecture
Day20	Euler's Theorem	25/8/22	12	Lecture
Day21	Assignment – Euler's theorem	26/8/22	12	Lecture
Day22	Test- Function of two variables	27/8/22	12	Lecture
Day23	Introduction of Reduction formulas	29/8/22	10	Lecture
Day24	Reduction formula for $\int sinx$ dx	30/8/22	11	Lecture
Day25	**Reduction formula for $\int cosx\,dx$**	31/8/22	12	Lecture
Day26	Examples of sinx cosx	1/9/22	11	Lecture

Day27	**examples**	2/9/22	11	Lecture
Day28	Assingment- Reduction formula for $\int sinx\,dx$	3/9/22	11	Lecture
Day29	Examples of $\int cosxdx$	5/9/22	10	Lecture
Day30	Reduction formuls for $\int sinxcosxdx$	6/9/22	10	Lecture
Day31	Assingment	7/9/22	10	seminar
Day32	**Test- Reduction formula**	8/9/22	12	seminar
Day33	**Assignment-Reduction formula for** $\int sinxcosxdx$	10/9/22	12	Lecture
Day34	**Introduction of vector calculus**	12/9/22	12	PPT
Day35	**Scalar point function**	13/9/22	12	Lecture
Day36	**Vector point function**	14/9/22	12	Lecture
Day37	**MCQ- Scalar and vector point function**	15/9/22	12	Lecture
Day38	**Geometrical meaning of Φ**	16/9/22	12	Lecture
Day39	**Directional derivative**	17/9/22	12	Lecture
Day40	**Assingment- Geometrical meaningΦ**	19/9/22	12	Lecture
Day41	**Property of Gradient**	20/9/22	12	Lecture
Day42	**Test-vector calculus**	21/9/22	12	Lecture
Day43	**Divergence and curl**	22/9/22	10	Lecture
Day44	**Assingment-Divergence and curl**	23/9/22	11	Lecture

Name of HOD - Nagtilak Rupali

PRINCIPAL
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Head of the Department
Mathematics

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Hemuji Chandele College, Shelgaon (R),

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Class – B.Sc. I

Semester –second

Subject-Mathematics

Paper – Geometry

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Change of Axis and Polar co-orinates	10/11/22	12	Lecture
Day2	Translation	11/11/22	12	Lecture
Day3	Rotations	12/11/22	12	Lecture
Day4	Translation and Rotations	14/11/22	10	Lecture
Day5	Identification of conics from general form of second degree equation	15/11/22	11	Lecture
Day6	Test-1	16/11/22	11	Test
Day7	Polar coordinates	17/11/22	12	Lecture
Day 8	Conversion formulae	18/11/22	12	Lecture
Day9	Equation of a conics in polar co-ordinate system	19/11/22	12	Lecture
Day10	Test- Change of Axis and polar coordinates	21/11/22	10	Test
Day11	**MCQ**	22/11/22	11	Test
Day12	Plane	23/11/22	11	Lecture
Day13	General equation of Plane.	24/11/22	12	Lecture
Day14	**Normal equation**	25/11/22	12	Lecture
Day15	Intercept form	26/11/22	10	Lecture
Day16	Angle between two planes	28/11/22	11	Lecture
Day17	Assignment-Translation and rotation	29/11/22	12	Lecture
Day18	Plane through three point	30/11/22	12	Lecture
Day19	Plane through a given point	1/12/22	12	Lecture
Day20	Two side of a plane	2/12/22	12	Lecture
Day21	Assignment	3/12/22	12	Lecture
Day22	Distance of a point from a plane	5/12/22	10	Lecture
Day23	Family of planes	6/12/22	11	Lecture
Day24	Test – Plane	7/12/22	11	Test
Day25	**Sphere**	8/12/22	11	Lecture
Day26	Centre radius form	9/12/22	10	Lecture
Day27	**General equation of a sphere**	10/12/22	9	Lecture
Day28	Diameter form	12/12/22	10	Lecture
Day29	Equation of a plane and condition for tangency	13/12/22	11	Lecture
Day30	Family of Sphere $s+\lambda P=0$ and $s+\lambda s'=0$	14/12/22	12	Lecture
Day31	MCQ Test	15/12/22	12	Test

Day32	Assignment	16/12/22	12	Lecture
Day33	**Test**	17/12/22	12	Test

Name of HOD - Nagtilak Rupali

Rupali.

Signature of HOD -Head of the Department
Mathematics

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Hemuji Chandele College, Shelgaon (R),

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Class – B.Sc. I

Semester –second

Subject-Mathematics

Paper- Differential Equation

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Differential equation of first order and first degree: (part -1)—Variables Homogeneous	19/12/23	10	Lecture
Day2	Non –homogeneous differential Equation	20/12/23	11	Lecture
Day3	MCQ	21/12/23	12	Test
Day4	Test-1	22/12/23	12	Test
Day5	Differential Equation of first order and first degree:[partII]	23/12/23	10	Lecture
Day6	Exact differential equation	24/12/23	10	Lecture
Day7	Necessary and Sufficient condition for exactness	26/12/23	10	Lecture
Day 8	Integrating Factor with four rules	27/12/23	9	Lecture
Day9	Linear differential equation of the form:dy/dx+Py=Q	28/12/23	8	Lecture
Day10	**Bernoulli Equation dy/dx+Py=Qy^n**	29/12/23	10	Lecture
Day11	**MCQ**	30/12/23	11	Test
Day12	Assignment- Linear equation of first order and first degree [part-I]	31/12/23	12	Lecture
Day13	Linear Differential Equation with Constant Coefficient: [partI]	2/1/23	12	Lecture
Day14	**Complementry function and particular integral**	3/1/23	11	Lecture
Day15	General solution of f(D)y=X	4/1/23	11	Lecture
Day16	Assignment- Linear differential equation of first order and first degree[part-II]	5/1/23	10	Lecture
Day17	Solution of f(D)y=0 for non -repeated	6/1/23	10	Lecture
Day18	Repeated real roots and complex roots	7/1/23	12	Lecture
Day19	Assignment-Solution of f(D)y=X, where X=e^{ax} and x^m	9/1/23	12	Lecture
Day20	MCQ	10/1/23	12	Test
Day21	Linear Differential Equation with Constant Coefficient[Part-II]	11/1/23	12	Lecture
Day22	Solution of f(D)y=X , where X is of the form e^{ax}	12/1/23	12	Lecture
Day23	Sin(ax), cos(ax),	13/1/23	12	Lecture
Day24	X^m , e^{ax}v	14/1/23	12	Lecture
Day25	**Assignment**	16/1/23	12	Lecture
Day26	test	17/1/23	11	Test

Day27	**Examples**	18/1/23	11	Lecture
Day28	Examples	19/1/23	11	Lecture
Day29	Examples	20/1/23	10	Lecture
Day30	Examples	21/1/23	11	Lecture
Day31	Examples	23/1/23	12	Lecture
Day32	Examples	24/1/23	12	Lecture
Day33	**Test**	25/1/23	12	Test

Name of HOD - Nagtilak Rupali

Signature of HOD - Rupali.
Head of the Department
Mathematics

SIGNSTURE OF PRINCILE
Golare.
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Hemuji Chandele College, Shelgaon (R),

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Class – B.Sc. II

Semester –Third

Subject- Differential calculus

Paper – v

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Introduction of Tangent and Normal	1/8/22	3	Lecture
Day2	Equation of tangent and normal	2/8/22	2	Lecture
Day3	Angle of intersection of two curves	3/8/22	3	Lecture
Day4	Assignment- Angle of intersection	4/8/22	2	Lecture
Day5	Length of tangent of normal and its examples	5/8/22	3	Lecture
Day6	Sub-tangent and sub-normal at any point of curve	6/8/22	2	Lecture
Day7	MCQ-Tangent and normal	8/8/22	2	Test
Day 8	Pedal equation or p,r and cartasian form	9/8/22	2	Lecture
Day9	Test- Tangent and Normal	10/8/22	3	Test
Day10	Assignment-Length of tangent and normal	11/8/22	3	Lecture
Day11	**Angle between radius vector and tangent**	12/8/22	3	Lecture
Day12	Length of perpendicular form pole to the tangent	13/8/22	3	Lecture
Day13	Length of polar subtangent	16/8/22	3	Lecture
Day14	**Length of polar subnormal**	17/8/22	2	Lecture
Day15	Pedal equation	18/8/22	3	Lecture
Day16	MCQ-Tangent and normal	19/8/22	3	Test
Day17	Derivatives of length of an arc(cartasian form)	20/8/22	3	Lecture
Day18	Differential coefficient of arclength	22/8/22	2	Lecture
Day19	Test- tangent and normal	23/8/22	3	Test
Day20	Introduction of curvatureand its definition	24/8/22	3	Lecture
Day21	Curvature of circle	25/8/22	2	Lecture
Day22	Radius of curvature	26/8/22	3	Lecture
Day23	Radius of curvature for intensic equation	27/8/22	3	Lecture
Day24	Assignment- Radius of curvaturefor intensic equation	29/8/22	3	Lecture
Day25	**Radius of curvature for intensic equation and its examples**	30/8/22	3	Lecture
Day26	Assignment- Radius of curvature for intensic	1/9/22	3	Lecture

y27	**Length of arc as a function and its examples**	2/9/22	3	Lecture
y28	Length of arc as a function and its examples	3/9/22	3	Lecture
ıy29	Radius of curvature	5/9/22	3	Lecture
ay30	Assignment – Radius of curvature	6/9/22	3	Lecture
ay31	Cartasian equation of radius of curvature	7/9/22	3	Lecture
ay32	**Radius of curvature for parametric equation**	8/9/22	3	Lecture
ay33	**Radius of curvature for parametric equatiuon and its examples**	9/9/22	3	Lecture
ay34	**Radius of curvature for polar equation**	10/9/22	2	Lecture
ay35	**Assignment- Radius of curvature for parametric equation**	12/9/22	3	Lecture
ay36	**Radius of curvature for polar equation r=f(Θ) and its examples**	13/9/22	3	Lecture
ay37	**Assignment- Radius of curvature for polar equation=f(Θ)**	14/9/22	3	Lecture
y38	**Test- curvature**	15/9/22	3	Test
ıy39	**Introduction of jacobians**	16/9/22	3	Lecture
ıy40	**Definition of jacobian**	17/9/22	2	Lecture
ıy41	**Jacobian of a function and its examples**	18/9/22	2	Lecture
y42	**MCQ-jacobian**	20/9/22	2	Test
y43	**Test-Jacobian function**	21/9/22	3	Test
y44	**Jacobian of function of function and its examples**	22/9/22	3	Lecture
y45	**Assignment of jacobian**	23/9/22	3	Lecture
y46	**Jacobian of Implicit function**	24/9/22	3	Lecture
y47	**Assignment of implicit function**	26/9/22	3	Lecture
y48	**Condition for dependent variable**	27/9/22	3	Lecture
y49	**Introduction of maximum function and minimum function**	28/9/22	3	Lecture
ı50	**Function of single variable**	29/9/22	1	Lecture
ı51	**Function of two variable**	30/9/22	2	Lecture
ı52	**Condtion for stationary value of a function of two variable**	1/10/22	3	Lecture
53	**The extreme value of function and its examples**	3/10/22	3	Lecture
54	**Necessary condition for extreme value**	4/10/22	3	Lecture
55	**Use of second order derivatives**	5/10/22	3	Lecture
56	**Lagranges method of undeterminate multiples**	6/10/22	3	Lecture
57	**Assignment – Lagranges method of undeterminate multiples**	7/10/22	3	Lecture

Day58	**Examples**	8/10/22	3	Lecture
Day59	**Test- Maxima and minima**	9/10/22	3	Test

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Class – B.Sc. II

Semester –Third

Subject- Laplace Transform

Paper – vI

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Introduction and definition of Laplace Transform	10/10/22	3	Lecture
Day2	Definition of integral transform and piecewise or sectional continuity	11/10/22	3	Lecture
Day3	Function of exponential order and function of class 's'	12/10/22	3	Lecture
Day4	Assignment- Function of exponential order	13/10/22	2	Lecture
Day5	Sufficient condition for existence of laplace transform	14/10/22	2	Lecture
Day6	Linearity Property	15/10/22	3	Lecture
Day7	MCQ- Laplace transform	17/10/22	3	Test
Day 8	Laplace transform of elementary function	18/10/22	3	Lecture
Day9	First Translation or shifting theorem	19/10/22	3	Lecture
Day10	Test- laplace transform	20/10/22	3	Test
Day11	**Second Translation or shifting theorem**	21/10/22	2	Lecture
Day12	Change or scale property	22/10/22	3	Lecture
Day13	Length of polar subtangent	24/10/22	3	Lecture
Day14	**Laplace transform of nth order derivative**	25/10/22	2	Lecture
Day15	Initial and final value theorem	26/10/22	2	Lecture
Day16	Assignment- Initial and final value theorem	27/10/22	2	Lecture
Day17	Multiplication by t and division by t	28/10/22	1	Lecture
Day18	The convolution theorem and periodic table	29/10/22	3	Lecture
Day19	Test- laplace transform	31/10/22	3	Test
Day20	Inverse laplace Transform	1/11/22	3	Lecture
Day21	Null function, Uniqueness of inverse laplace transform	2/11/22	3	Lecture
Day22	Assignment inverse Laplace transform	3/11/22	3	Lecture
Day23	Linearity Property and its examples	4/11/22	3	Lecture
Day24	First translation or shifting theorem	5/11/22	2	Lecture
Day25	**Second translation and shifting theorem**	7/11/22	2	Lecture
Day26	MCQ- Inverse laplace transform	8/11/22	2	Test
Day27	**Change of scale property**	9/11/22	3	Lecture
Day28	Method of partial function	10/11/22	3	Lecture

Day29	Inverse laplace transform of derivatives	11/11/22	3	Lecture
Day30	Assignment – Method of partial function	12/11/22	3	Lecture
Day31	Inverse laplace Transform of integrals	14/11/22	3	Lecture
Day32	**Multilication by powers of s**	15/11/22	3	Lecture
Day33	**Division by power of s**	16/11/22	2	Lecture
Day34	**Definition of convolution theorem**	17/11/22	2	Lecture
Day35	**Assignment-Inverse laplace transform of Integrals**	18/11/22	2	Lecture
Day36	**Convolution theorem**	19/11/22	2	Lecture
Day37	**MCQ**	21/11/22	2	Test
Day38	**Test- the convolution theorem**	22/11/22	3	Test
Day39	**Heavisides expansion theorem theorem or formula and the beta function**	23/11/22	3	Lecture
Day40	**Application laplace transform**	24/11/22	3	Lecture
Day41	**Solution of ordinary differential equation with constant coefficient**	25/11/22	1	Lecture
Day42	**Ordinary differential equation with constant coefficient**	26/11/22	3	Lecture
Day43	**Assignment- ordinary differential equation with constant coefficient**	28/11/22	3	Lecture
Day44	**Ordinary differential equation with constant coefficient and its examples**	29/11/22	3	Lecture.
Day45	**Test- Application of Laplace Transform**	30/11/22	3	Test

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Class – B.Sc. II

Sem-Fourth

Subject-Mathematics

Paper-VII [Differential Equations]

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Differential Equation of the first order and of degree higher than the first:	2/1/23	3	Lecture
Day2	Equation that can be resolved by into factors of the first degree	3/1/23	3	Lecture
Day3	Equation solvable for x	4/1/23	3	seminar
Day4	Equation solvable for y	5/1/23	3	Lecture
Day5	Assignment	6/1/23	3	Lecture
Day6	Clairaut's Equation	7/1/23	3	Lecture
Day7	Equations reducable to clairaut's form	9/1/23	3	Lecture
Day 8	Test	10/1/23	3	Test
Day9	Linear Equations of the second order	11/1/23	2	Lecture
Day10	**General Form of the second order linear equation**	12/1/23	3	Lecture
Day11	**Complete solution when one integral belonging to complementary function is known**	13/1/23	3	Lecture
Day12	Rules of getting an intergral belonging to complementary function	14/1/23	3	Lecture
Day13	Removal of the order Derivative	16/1/23	3	Lecture
Day14	**Transformation of the linear equation of second order by Changing the independent variable**	17/1/23	2	Lecture
Day15	Assignment	18/1/23	3	Lecture
Day16	Homogeneous linear equation	19/1/23	3	Lecture
Day17	Working rule for fining the solution	20/1/23	3	Lecture
Day18	Equations reducible to Homogeneous form	21/1/23	3	Lecture
Day19	Assignment-Linear equation of the second order and Homogeneous linear equation (partII)	23/1/23	3	Lecture
Day20	MCQ	24/1/23	3	Test
Day21	Simultaneous Equation	25/1/23	2	Lecture
Day22	Nature of the solution of simultaneous equation	27/1/23	2	Lecture
Day23	Rules of solving the equation	28/1/23	3	Lecture
Day24	Test	30/1/23	2	Test
Day25	**Assignment- Simultaneous equation and Total**	31/1/23	2	Lecture

	Differential Equation			
Day26	Total Differential Equations	1/2/23	1	Lecture
Day27	**Necessary and sufficient condition for the integrability of total differential equation(proof of necessity only)**	2/2/23	3	Lecture
		3/2/23	3	Lecture
Day28	Condition for exactness	4/2/23	3	Lecture
Day29	Criterian for exactness	6/2/23	3	Lecture
Day30	Method of solving the Equation	7/2/23	3	Lecture
Day31	MCQ	8/2/23	3	Test
Day32	Test	9/2/23	3	Test
Day33	**assignment**	10/2/23	3	Lecture

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Class – B.Sc. II

Sem-Fourth

Subject-Mathematics

Paper-VIII [Abstract Algebra]

Day's	Task to be completed	Dated on	Attendance	Methodology
Day 1	Introduction to Groups	11/2/23	3	Lecture
Day2	Definition and Example of Groups	13/2/23	3	seminar
Day3	Permutation	14/2/23	3	Lecture
Day4	Subgroups	15/2/23	3	Lecture
Day5	Groups and symmetry	16/2/23	3	Lecture
Day6	Test	17/2/23	2	Test
Day7	Assignmen-tGroups	18/2/23	1	Lecture
Day 8	Equivalence ,Congruence, Divisibility	20/2/23	3	Lecture
Day9	Equivalence relation and partitions	21/2/23	3	Lecture
Day10	**Congruence and Division Algorithm**	22/2/23	3	Lecture
Day11	**Inteer Modulo n**	23/2/23	3	Lecture
Day12	Gretest Common Divisors	24/2/23	1	Lecture
Day13	The Euclidian Algorithm	25/2/23	3	Lecture
Day14	**Factorization**	24/2/23	3	Lecture
Day15	Assignment	28/2/23	3	Lecture
Day16	Euler's Phi Function	1/2/23	2	Lecture
Day17	Test	2/2/23	2	Test
Day18	Groups	3/2/23	1	Lecture
Day19	Elementary Properties of Groups	4/2/23	1	Lecture
Day20	Generators	6/2/23	3	Lecture
Day21	Direct Product	7/2/23	3	Lecture
Day22	Cosets	8/2/23	3	Lecture
Day23	Lagranges Theorem	9/2/23	3	Lecture
Day24	Test	10/2/23	3	Test
Day25	**Isomorphism**	11/2/23	3	Lecture
Day26	Total Differential Equations	13/2/23	3	Lecture
Day27	**More on Isomorphism**	14/2/23	3	Lecture
Day28	Cayleys Theorem	15/2/23	3	Lecture
Day29	Assignment	16/2/23	3	Lecture
Day30	Groups Homomorphism	17/2/23	3	Lecture
Day31	Kernels	18/2/23	3	Lecture
Day32	Quotient Groups	20/2/23	3	Lecture
Day33	**The Fundamental theorem of Homomorphism**	21/2/23	3	Lecture.

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	Headerfooters, border and shading, bullets, mail merge, Table,	27/9/22	12	Lecture
Day19	graphics, label, Templates, Wizards and Printing Techniques.	28/9/22	10	
Day20	**Microsoft Excel:** -Introduction to excel, File management in excel, operations relatedto workbook, formatting	29/9/22	12	Experiential Learning
Day21	sheet, adding formulate and functions, charts and maps,data menu, view menu, ,	30/9/22	11	Lecture
Day22	work with multiple worksheets importing and exporting ofdata.	30/9/22	10	Lecture
Day23	**Microsoft PowerPoint:** Introduction and Applications of Power Point, create a NewPresentation, ,	2/10/22	11	Experiential Learning
Day24	Adding Slides Clip Arts, Smart art,	2/10/22	10	Lecture
Day25	Charts, Text, images and otherobjects,	3/10/22	9	Lecture
Day26	Templates and Master Slides, Giving Animation	4/10/22	10	Lecture
Day27	effects, Links and Actionbuttons	5/10/22	11	Lecture
Day28	Revision	6/10/22	9	Lecture

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Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. I

Semester – I

Subject – Computer Science

Paper – I Programming Using C

Day's	Task to be completed	Dated on	Attendance	Methodology
Day1	Programming languages (Machine Languages, Assembly Languages, High levellanguages),	22/9/22	9	participatory Learning
Day2	Compiler, Assembler, Interpreter.	7/10/22	8	Lecture
Day3	Planning the Computer Program: Concept of problem solving, ,	7/10/22	9	PPT
Day4	Problem definition,Program design	8/10/22	7	Lecture
Day5	, Debugging, Types of errors in programming,	8/10/22	10	Lecture
Day6	Documentation.,Concept of Algorithm, Characteristics,	9/10/22	10	Lecture
Day7	Notation of Algorithm, Designing AlgorithmsWriting step by step procedure,	9/10/22	11	Lecture
Day8	Flowcharts- Definition, Symbol, features,representation in terms of Flow chart,	10/10/22	12	Lecture
Day9	Advantages and Limitations of Flow Charts,Pseudo code generation, Tracing, Testing	11/10/22	10	Lecture
Day10	History, Features of C,	12/10/22	11	Lecture
Day11	Structure of 'C' programming, C-Tokens, Data types,Operators, Control Statements-	13/10/22	12	Lecture

	Conditional control statements, Looping,	15/10/22	10	Lecture
Day12	Unconditionalcontrol statements Array definition and declaration,	17/10/22	9	Lecture
Day13	Types of array, Accessing Array, array manipulation,searching,	18/10/22	10	Lecture
Day14	insertion,deletion of an element from an array,	19/10/22	11	Lecture
Day15	basic matrix operations,dynamic array,	20/10/22	10	Lecture
Day16	String-Declaration and Initialization of String	21/10/22	9	Lecture
Day17	operation on string,inbuilt String handling functions,	22/10/22	2	Lecture
Day18	arithmetic operation on string.	24/10/22	3	Lecture
Day19	table of string	25/10/22	5	Lecture
Day 20	Unit Test	26/10/22	7	Lecture
Day 21	Revision	28/10/22	8	Lecture

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Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. I

Semester – II

Subject – Computer Science

Paper – Introduction to Web Designing

Day's	**Unit I:- Overview of HTML & HTML5** Introduction	Dated on	Attendance	Methodology
Day1	Introduction to Networking, Network topology, LAN, MAN, WAN,	3/1/23	5	Lecture
Day2	Introduction to Internet, Requirement for Internet.	3/1/23	4	Lecture
Day3	Introduction to HTML, Overview of basic HTML , Structure of HTML, Creating and opening HTML file,	4/1/23	3	Lecture
Day4	Singular and paired tags, Text formatting tag, Anchor tag, Lists,Image, Image Map, Table, Frames and Frameset,	5/1/23	3	Lecture
Day5	HTML5: Introduction to HTML5, Need of HTML5, DOCTYPE Element, Tags-Section,Article, aside, header,	6/1/23	4	Lecture
Day6	footer, nav, dialog, figure etc. Events in HTML5, Input tag (Type,Auto focus, placeholder, required etc.	7/1/23	4	Lecture
Day7	attributes.) in HTML5, Graphics in HTML5,Media tags in HTML5	9/1/23	4	Lecture
Day8	**Unit II:- Introduction to CSS** Introduction	10/1/23	4	Lecture
Day9	I to CSS, Use of CSS, Types of CSS, Selectors, Properties, Values.	11/1/23	5	Lecture
Day10	CSS Properties: - Background, Text, Fonts, Link, List, Table, Box Model, Border,Margin, Padding, Display,	12/1/23	4	Lecture
Day11	Positioning, Floating, Opacity, Media type, Backgroundsand Borders Image, Values and Replaced Content, Text	13/1/23	4	Lecture
Day12	Effects,2D/3D, Transformations, Animations, Multiple Column Layout	14/1/23	4	Lecture
Day13	, User Interface, CSS interact with JavaScript.	16/1/23	4	Lecture
Day14	**Unit III:- JavaScript** Introduction	20/1/23	4	Lecture
Day15	Introduction to JavaScript, JavaScript Variables & Data types, Operators, Built in functions in JavaScript Control	21/1/23	4	Lecture

Day16	structure in JavaScript, DOM, Math, Array, History, Navigator, Location, Windows, String, Date, Document	9/2/23	4	Lecture
Day17	objects, user defined function, Validation in JavaScript, event & event handling in JavaScript.	9/2/23	3	PPt
Day18	**Unit I:- Overview of HTML & HTML5** introduction	10/2/23	2	Lecture
Day19	Introduction to Networking, Network topology, LAN, MAN, WAN	13/2/23	3	Lecture
Day20	, Introduction to Internet, Requirement for Internet.	14/2/23	3	Lecture
Day21	Introduction to HTML, Overview of basic HTML , Structure of HTML, Creating and opening HTML file,	15/2/23	4	Lecture
Day22	Singular and paired tags, Text formatting tag, Anchor tag, Lists, Image, Image Map, Table, Frames and Frameset,	16/2/23	5	Lecture
Day23	HTML5: Introduction to HTML5, Need of HTML5, DOCTYPE Element, Tags-Section, Article, aside, header,	17/2/23	5	Lecture
Day24	footer, nav, dialog, figure etc. Events in HTML5, Input tag (Type, Auto focus, placeholder, required etc.	18/2/23	5	Lecture
Day25	attributes.) in HTML5, Graphics in HTML5,Media tags in HTML5	20/2/23	4	Lecture
ay26	**Unit II:- Introduction to CSS**	21/2/23	4	Lecture
Day27	Introduction to CSS, Use of CSS, Types of CSS, Selectors, Properties, Values.	22/2/23	3	Lecture
Day28	CSS Properties: - Background, Text, Fonts, Link, List, Table, Box Model, Border, Margin, Padding, Display,	23/2/23	3	Lecture

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Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. I

Semester – II

Subject – Computer Science

Paper – I Programming Using C-II

Day's	Task to be completed	Dated on	Attendance	Methodology
Day1	**Unit I**: -**Function and Pointer** Definition, declaration, function prototypes,	3/1/23	3	Lecture
Day2	Local and global variables, User defined functions, recursion,	3/1/23	4	Lecture
Day3	passing array and string to function, Storage classes Pointers- Definition and declaration, Operation on pointer,	4/1/23	3	Lecture
Day4	Pointer initialization, Pointer and function, Pointer and array, Pointer of pointer, Call by value and Call	5/1/23	3	Lecture
Day5	byreference, Dynamic memory allocation	6/1/23	3	Lecture
Day6	**Unit II**: -**Structures and Union** Definition and declaration, copying and comparing of structure,	7/1/23	4	Lecture
Day7	Array of structures, Passing structure to	9/1/23	5	Lecture
Day8	function, Pointer to structure, Nested structure, self-referential structure, Size of and type def, Definition and	10/1/23	3	Lecture
Day9	declaration of union, difference between structure, union and array.	11/1/23	3	Lecture
Day10	**Unit III**:-**File Handling** Defining, opening and closing of file, operations on file	12/1/23	4	Lecture
Day11	, Standard input and output functions, formatted input	13/1/23	3	Lecture
Day12	and output functions, File opening modes, Error handling, Random access of file, command line argument.	14/1/23	3	Lecture
Day13	Macros and Preprocessing-Features of C preprocessor, Macro – Declaration ,Expansion, File Inclusion	16/1/23	2	Lecture
Day14	Graphics using C - VDU Basics, Simple library functions- getpixel, putpixel, line, rectangle, circle, ellipse, arc etc.	20/1/23	2	Lecture
Day15	**Unit I**: -**Function and Pointer** Definition, declaration	21/1/23	1	Lecture
Day16	, function prototypes, Local and global variables, User defined	23/1/23	2	Lecture

Day17	functions, recursion,	9/2/23	5	Lecture
Day18	passing array and string to function, Storage classes Pointers- Definition and declaration, Operation on pointer,	9/2/23	4	Lecture
Day19	Pointer initialization ,Pointer and function, Pointer and array, Pointer of pointer, Call by value and Call	10/2/23	4	Lecture
Day20	By reference, Dynamic memory allocation	13/2/23	4	Lecture
Day21	**Unit II**: -**Structures and Union** Definition and declaration, copying and comparing of structure	14/2/23	4	Lecture
	, Array of structures, Passing structure to	15/2/23	5	Lecture

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Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. II

Semester – III

Subject – Computer Science

Paper – V: Data Structures

ay's	Task to be completed	Dated on	Attendance	Methodology
ay1	Introduction of Data Structure, Need of Data Structure	1/8/22	4	Lecture
ay2	,Types of Data Structure, ADT,	2/8/22	2	Lecture
ay3	Stack: Introduction to stack, Representation-static & dynamic, , ,	3/8/22	3	Lecture
ay4	stack Operations, Application -infix to postfix & prefix, postfix evaluation	4/8/22	2	Lecture
ay5	recursion, expression validity. Queues: Introduction to Queue, Representation -static & dynamic	5/8/22	2	Lecture
ay6	Operations, Circular queue, Double ended queue, priority queues, Applications of Queue.	6/8/22	3	Lecture
ay7	Linked List:-Introduction to List, Implementation of List – static & dynamic representation,	8/8/22	3	Lecture
ay8	Types of Linked List, Operations on List	9/8/22	3	Lecture
y9	, Applications of Linked List – polynomial manipulation	10/8/22	3	Lecture
10	Trees: Concept & Terminologies, Binary tree, binary search tree, Representation – static &dynamic	11/8/22	3	Lecture
ay11	Operations on BST – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes	12/8/22	1	Lecture
ay12	, Height balance tree- AVL,B tree,B+ Tree, Graph- Graph terminology,	13/8/22	2	Lecture
ay13	Representation of graphs, Graph	16/8/22	3	Lecture
ay14	Traversal–BFS (breadth first search),DFS (depth first search), Minimum spanning Tree	17/8/22	3	Lecture
ay15	TEST	18/8/22	3	Lecture
ay16	Sorting: Bubble sort,	19/8/22	3	Lecture

Day17	Quick sort,	20/8/22	3	Lecture
Day18	Simple Insertion sort,	22/8/22	2	Lecture
Day19	Shell sort	23/8/22	3	Lecture
Day20	Address calculation sort	24/8/22	3	Lecture
Day21	Selection Sort,	25/8/22	4	Lecture
Day22	Heap Sort	26/8/22	1	Lecture
Day23	Merge sort	27/8/22	2	Lecture
Day24	Unit test	29/8/22	3	Lecture
Day25	Radix Sort.		4	Lecture
Day26	Searching: Linear Search,	30/8/22	2	Lecture
Day27	Binary Search,	1/9/22	3	Lecture
Day28	and Tree searching methods,	2/9/22	3	Lecture
Day29	Multiway search tree	3/9/22	3	Lecture
Day30	, Hash function (open and close)	6/9/22	3	Lecture
Day31	Revision of All Syllbus	7/9/22	4	Lecture

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. II

Semester – III

Subject – Computer Science

Paper – VI: Software Engineering

Day's	Task to be completed	Dated on	Attendance	Methodology
Day1	System concepts: Introduction system, characteristics,	10/10/22	3	Lecture
Day2	Elements of system, Types of system,	11/10/22	3	Lecture
Day3	System Analysis, Role of System Analyst	12/10/22	4	Lecture
Day4	. Software Engineering: Definition, Characteristics of software,	13/10/22	5	Lecture
Day5	Waterfall model, V-shape model	14/10/22	4	Lecture
Day6	Spiral model, Prototyping,.	15/10/22	3	Lecture
Day7	incremental, RAD, Agile	17/10/22	2	Lecture
Day8	Software requirements: Types of Requirements: .	18/10/22	2	Lecture
Day9	System, Functional, Non-functional, User.	19/10/22	2	Lecture
Day10	Fact finding techniques: Interviews, Questionnaire,	20/10/22	3	Lecture
y11	Record reviews, Observation. Analysis and Design Tools:	21/10/22	2	Lecture
12	Flow chart, Decision tables and Trees, Structured English	22/10/22	2	Lecture
ay13	, HIPO. System Design: Data flow Diagram (Physical, Logical),	24/10/22	3	Lecture
ay14	Entity relation diagram ERD, Data Dictionary,	25/10/22	3	Lecture
ay15	Unit Test	26/10/22	2	Lecture
ay16	structured chart, Input and output design, Case studies: Pay Roll, Fixed Deposit, Inventory system,	27/10/22	2	Lecture
ay17	College Admission System, Library System, Loan system	28/10/22	3	Lecture
ay18	Coding: Coding standards, Size Estimation,	29/10/22	3	Lecture
ay19	Effort Estimation, and Cost Estimation, Software Testing: Need of Testing	31/10/22	3	Lecture

Day20	, types of testing, Software Implementation and Maintenance: Traditional and incremental approaches,	1/11/22	3	Lecture
Day21	conversion methods, Overview of maintenance process	2/11/22	4	Lecture
Day22	types of maintenance. Software Quality Assurance:	3/11/22	1	Lecture
Day23	SQA Tasks, Goals and Metrics,	4/11/22	2	Lecture
Day24	Software Reliability.	5/11/22	3	Lecture
Day25	Unit Test	7/11/22	4	Lecture
Day26	Software risk management: definition,	8/11/22	3	Lecture
Day27	types of risk	9/11/22	3	Lecture
Day28	risk identification-	10/11/22	3	Lecture
Day29	risk monitoring and management	11/11/22	2	Lecture
Day30	Revision Of All Syllabus	14/11/22	2	Lecture

NAME OF HOD

Surwase I.R

SIGN OF HOD

PRINCIPAL

Hemuji Chandele College Shelgaon (R)

Tal-Barshi, Dist-Solapur

SINGATURE OF PRINCIPAL

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. II

Semester – IV

Subject – Computer Science

Paper – VII (Core Java)

Day's	Task to be completed	Dated on	Attendance	Methodology
Day1	Overview of Java, Features of Java as programming language	3/1/23	4	Leture
Day2	Platform, JDK Environment and Tools	3/1/23	5	Leture
Day3	Data types, Variables, Operators, Keywords, Naming	4/1/23	3	Lecture
Day4	Conventions, Structure of Java Program	5/1/23	3	Lecture
Day5	Flow Control- Decision, Iterations, Arrays,	6/1/23	2	Lecture
Day6	Class – Members access control, Objects, Constructors, Use of 'this' keyword, Static, non-static	7/1/23	2	Lecture
Day7	data members and methods., public, private & protected data members	9/1/23	3	Lecture
Day8	Access/Scope specifiers protected, Super, extends, single,	10/1/23	4	Lecture
Day9	multiple inheritance, Method overriding, Abstract classes & ADT, 'final' keyword, Extending	11/1/23	5	Lecture
y10	interfaces	12/1/23	4	Lecture
y11	Exceptions and Types, try..catch, finally block, throw & throws	13/1/23	4	Lecture
12	statement, user-defined exceptions,	14/1/23	4	Lecture
ay13	Java I/O package, byte & character stream, reader & writer, file reader & writer	16/1/23	5	Lecture
ay14	Java thread lifecycle, Thread class & run able interface	17/1/23	2	Lecture
ay15	Thread priorities &synchronization, Usage of	18/1/23	2	Lecture
ay16	wait & notify	19/1/23	3	Lecture
ay17	Collection overview, Collection interfaces, Collection classes	20/1/23	4	Lecture
ay18	Vector,Array list, Hash map, Hash table, Tree map, Tree set,	21/1/23	5	Lecture
ay19	Hash set, Properties, Stack	23/1/23	5	Lecture
ay20	Introduction to swing,	24/1/23	4	Lecture
ay21	difference between AWT and swing, hierarchy of Swing classes,	25/1/23	4	Lecture
ay22	Swing controls: - JButton, JTextfield, JLabel, JCheckBox, JRadionButton, JFame, Jtable, JList,	27/1/23	4	Lecture

y23	JoptionPane, JMenuitem and JMenu ,etc	1/2/23	4	Lecture
y24	Overview of Java,	2/2/23	3	Lecture
y25	Features of Java as programming language /Platform, JDK Environment and	3/2/23	2	Test
y26	Tools	3/2/23	1	Lecture
y27	Data types, Variables, Operators, Keywords, Naming	6/2/23	2	Test
y28	Conventions, Structure of Java Program, Flow Control- Decision, Iterations, Arrays,	7/2/23	3	Lecture
y29	**Unit Test**	8/2/23	3	Lecture
y30	Class – Members access control, Objects, Constructors, Use of 'this' keyword, Static, non-static	9/2/23	4	Test
y31	data members and methods., public, private & protected data members	9/2/23	3	Lecture
y32	Access/Scope specifiers protected, Super, extends, single,	10/2/23	3	Lecture

NAME OF HOD

Surwase I.R.

SIGN OF HOD

PRINCIPAL

Hemuji Chandele College Shelgaon (R)

Tal-Barshi, Dist-Solapur

SINGATURE OF PRINCIPAL

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Department Of Computer Science(2022-23)

Teaching Plan

Class- B.Sc. II

Semester – IV

Subject – Computer Science

Paper – VIII: DBMS Using Oracle

Day's	Task to be completed	Dated on	Attendance	Methodology
Day1	Introduction to database system:-Definition, Limitations of traditional file system, Advantages of DBMS,	11/2/23	4	Lecture
Day2	Components of DBMS, Database Architecture	13/2/23	3	Lecture
Day3	Database Users, Schemas and instances,	14/2/23	2	Lecture
Day4	2 tier and 3 tier architecture,	15/2/23	4	Lecture
Day5	Database languages, Types of data models- relational, Network,	16/2/23	4	Lecture
Day6	Hierarchical, Distributed	17/2/23	3	Lecture
Day7	Transaction Management & Concurrency Control: -Introduction, Definition	18/2/23	4	Lecture
Day8	properties, transaction states, scheduling and its types,	20/2/23	4	Lecture
Day9	conflict and view serializability. Introduction to Concurrency Control	21/2/23	3	Lecture
Day10	problems of concurrency control. lock based protocols,	22/2/23	5	Lecture
Day11	timestamp-based protocol, deadlock,	23/2/23	1	Lecture
Day12	deadlock handling. Database recovery and Atomicity: -Introduction, recovery algorithms,	24/2/23	3	Lecture
Day13	log base recovery, shadow paging, checkpoints or syncpoints or savepoints	25/2/23	2	Lecture
Day14	MCQ Test	26/2/23	2	Test
Day15	SQL: DDL, DML, DCL,	28/2/23	3	Lecture
Day16	select: From, Where, Order by, Group by, Having, Intersect, Union,	1/3/23	4	Lecture
Day17	Distinct, Between, In, Between, Different types of functions, Delete,	2/3/23	5	Lecture
Day18	Update, Insert, Nested queries, joins, create, alter and drop,	4/3/23	6 5	Lecture

Day19	constrains, index, views, Triggers, Grant, Revoke, Commit, RollBack, Savepoint	6/3/23	3	Lecture
Day20	Introduction to PL/SQL, Advantages, Architecture, Datatypes,	7/3/23	3	Lecture
Day21	Variable and Constants, Using Built_in Functions, Conditional, Looping and Iterations Statements.	8/3/23	2	Lecture
Day22	Cursor in PL/SQL: Types of Cursors, Cursor Attributes, Cursor with Parameters, Cursors with LOOPs Nested Cursors,	9/3/23	3	Lecture
Day23	Cursors with Sub Queries and procedure. Procedures in PL/SQL: STORED PROCEDURES, PROCEDURE with Parameters (IN,OUT and IN OUT),	10/3/23	4	Lecture
Day24	Dropping a Procedure.	11/3/23	3	Lecture
Day25	Functions in PL/SQL: Difference between Procedures and Functions,	13/3/23	4	Lecture
Day26	types of functions and parameter modes	16/3/23	3	Test
Day27	Exceptions in PL/SQL	15/3/23	2	Test
Day28	Unit Test	17/3/23	2	Test

NAME OF HOD

Syrwase J. R.

SIGN OF HOD

PRINCIPAL

Hemuji Chandele College Shelgaon (R)

Tal-Barshi, Dist-Solapur

SINGATURE OF PRINCIPAL

Time-table
B. Sc. I

Sr. No.	Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Practical					
1	09.10 to 10.50	Bot/Physics	Zoo/Maths	Micro/Comp.	Chemistry	Chemistry	Library
		Lecture					
2	10.50 to 11.40	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths
3	11.40 to 12.30	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics
	12.30 to 12.50	**BREAK**					
4	12.50 to 01.40	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.
5	01.40 to 02.30	Chemistry	Chemistry	Chemistry	Chemistry	Chemistry	Chemistry

Time-table
B. Sc. II

Sr. No.	Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		Practical				Micro/Comp	Liberary time
1	09.10 to 10.50	Chemistry	Chemistry	Botany/Phy	Zoo/Maths	~~Zoo/Maths~~	Zoo/Maths
		Lecture					
2	10.50 to 11.40	Chemistry	Chemistry	Chemistry	Chemistry	Chemistry	Chemistry
3	11.40 to 12.30	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.	Micro./Comp.
	12.30 to 12.50	**BREAK**					
4	12.50 to 01.40	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths	Zoo/Maths
5	01.40 to 02.30	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics	Bot/Physics

Tuljabhavani Mahila Mandal's
Hemuji Chandele College, Shelgaon (R),
Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC I

NAME : Miss Jadhav Nikita

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	I	B.SC I	Inorganic chemistry	100%
	-			

Sr.no	Student name	Signature of students
1	Swaranjali Ramraje Mote	S.R.Mote
2	Sneha Rajkumar Gore	S.R. Gore
3)	Rajani Rajendra Kade	Rkade
4)	Mayuri Ramesh Pandharmise	M.R. pandharmise
5)	kiran bharat shinde	Kiran
6)	Saniya nasim Beg	
7]	Tanuja kumar Mane	T. k Mane
8]	Karande Sakshi Suryakant	S.S.karande.
9]	Disale Rutuja Rameshwar	Disale R.R.
10)	Salunke Rajeshwari shivdas	R.S.Salunke
11)	Shaikh Simran mubarak	shaikh
12)	Lohar Gauri Mahadev	Gauri
13)	Aware Swati Mohan	Aware S.M.

Sr.no	Student name	Signature of students
14)	Nichal Sanika Sambhaji	S.S.nichal
15)	Jadhav Anisha Babasaheb	A.B.Jadhav
16]	Patil Vaishnavi Sanjay	V.S.Patil.
17]	Jadkar Puja Dattatray	P.D.Jadkar
18]	Aware Nisha sudhkar.	Aware N.S.
19]	shelake swaranjali vinayak	Shelke
20]	More onkar vishwas	onkar
21]	More om shitalkumar	More
22]	Awhre Dhiraj Annasaheb	Awhre D.A.
23]	Kadam Pam Omyeshwar	Pam
24	Kapase Rushikesh sampat	R.S. Kapase.
25)	Nikam rohit santosh.	R.S. Nikam.
26)	Nitin Santosh Dalavi	N.S.Dalavi
27)	Jadhar Krusnnat Ramchandra	K.R.Jadhar
~~28)~~	~~Kapase Rus~~	

Tuljabhavani Mahila Mandal's
Hemuji Chandele College, Shelgaon (R),
Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC III

NAME : MISS BACHUTE R.S.

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	V	B.SC III	PHYSICAL CHEMISTRY	100%
2	V	B.SC III	Analytical chemistry	100%

Sr.no	Student name	Signature of students
1)	Raut Ankita Jeevan	A.J.Raut
2)	shinde Divydeani Rajendra	D.R.shinde.
3)	Atar Tamanna Sharn	T.S.Atar
4)	sherkhane Pranita Pavan	sherkhane.P.P.
5)	Aware Pranali Maharudra	
6)	Dige Rutuja Balasaheb	R.B.Dige.
7)	kapase Tejaswini Sampat	T.S.kapase
8)	Mali pratiksha kumar	P.K.mali
9)	Jagtap Pritam umesh	P.U.Jagtap
10)	Jadhav kirti shankar	K.S.Jadhav.
11)	Devkar Rani Angad	Rani
12)	Kanade snehal Arun	SnehalA.K.
13)	Katkar Renuka Ramling	Katkar.R.R

Sr.no	Student name	Signature of students
14)	Awaire Samarth Pandurang	[illegible]
15)	Mohite Rajsinh Satish	[illegible]

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC III

NAME : MISS Jadhav Nikita

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	V	B.SC III	Inorganic CHEMISTRY	100%

Sr.no	Student name	Signature of students
1)	Raut Ankita Jeevan	A.J.Raut
2)	shinde Divyarani Rajendra	D.R.shinde.
3]	Atar Tejmanna Sharn	T.S. Atar
4)	sherkhane Pranita pavan	sherkhane.P.P
5)	Aware Pranali Maharudra	
6]	Dige Rutuja Balasaheb	R.B.Dige.
7]	Kapase Tejaswini Sampat	T.S.Kapase
8]	mali pratiksha kumar	P.K.mali
9)	Jagtap pritam umesh	P.U.Jagtap
10]	Jadhav kirti shankar	K.S.Jadhav.
11]	Devkar Rani Angad	Rani
12)	Kanade snehal Arun	Snehal.A.K
13)	Katkar. Renuka Ramling	Katkar.R.R
Sr.no	Student name	Signature of

		students
	Mohite Rajsinh Satish	
	Awore Samarth Pandurang	

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC III

NAME : Gaikwad Mahesh

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	V	B.SC III	Organic chemistry	100%

Sr.no	Student name	Signature of students
1)	Raut Ankita Jeevan	A.J.Raut
2)	Shinde Divyaani Rajendra	D.R.shinde.
3]	Atar Tamanna sharn	T.S. Atar
4)	sherkhane Pranita Pavan	sherkhane.P.P.
5)	Aware Pranali Maharudra	~~Aware~~
6]	Dige Rutuja Balasaheb	R.B.Dige.
7]	Kapase Tejaswini Sampat	T.S. Kapase
8)	Mali pratiksha kumar	P.K.mali
9)	Jagtap Pritam umesh	P.U.Jagtap
10]	Jadhav kirti Shankar	K.S.Jadhav.
11]	Devkar Rani Angad	Rani
12)	Kanade Snehal Arun	Snehal.A.K.
13)	Katkar Renuka Ramling	Katkar.R.R

Sr.no	Student name	Signature of students
	Mohite Rajsinh Satish	
	Awdare Samarth Pandurang	

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC II

NAME : Miss Jadhav Nikita

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	III	B.SC II	Inorganic chemistry	100%

Sr.no	Student name	Signature of students
1	Gaikwad Akanksha Appasaheb	Akwad
2	Dange Sandhya Ishwar	Dange.S.I
3)	Navgude Anjali Tukaram	Navgude.A.T
4)	Bhosale Vaishnavi Dipak	V.D.Bhosale
5)	Rode Vaishnavi Sarjerao	Rode
6)	Bhosale sakshi Navnath	Sakshi.
7)	Patil Sandhya Santosh	Sandhya
8)	Bhosale Komal Pandhari	Komal.
9)	Sirsat Rutuja Rohidas	R.R. Sirsat
10)	Patil Pratiksha Vijaykumar	Patil.
11	Bhosale Sankita Mohan.	Bhosale
12)	Alat Nikita Dattatray	Alat
13)	Adsul Samruddhi Panduranga	Samruddhi
14)	Kashid Sanika Dadarao	Sanika

Sr.no	Student name	Signature of students
15)	Barbade Sakshi Basveshwar	Sakshi.
16)	Patil Vaishnavi Dayanand	Vaishnavi
17	Ghodake Trupti Rajabhau	T.R. Ghodake.

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syallabus complection report AY -2022/23

Department of -CHEMISTRY

CLASS : B.SC II

NAME : : Gaikwad Mahesh

SR.NO	SEM	CLASS	PAPER NAME	SYALLUBUS COMPLETED
1	III	B.SC II	organic chemistry	100%

Sr.no	Student name	Signature of students
1)	Navgude Anjali Tukaram	Navgude.A.T
2)	Bhosale Vaishnavi Dipak	V.D.Bhosale
3)	Rode vaishnavi Sarjerao	Rode
4)	Gaikwad Akanksha Appasaheb	Gaikwad
5)	Dange Sandhya Ishwar	Dange .S.I
6)	Bhosale Sakshi Navnath	Sakshi.
7)	Patil* Sandhya Santosh	Sandhya
8)	Bhosale Komal Pandhari	Komal.
9)	Sirsat Rutuja Rohidas	R.R. Sirsat
10)	patil pratiksha vijaykumar	Patil
11)	Bhosale sankita mohar	SB
12)	Alat Nikita Dattatray	Alat
13)	Adsul samruddhi Pandurang	Samruddhi
14)	Kashid Sanika Dadarao	Sanika

Sr.no	Student name	Signature of students
15)	Barbade Sakshi Basveshwar	Sakshi
16)	Patil Vaishnavi Dayanand	V.patil
17	Ghodake Trupti Rajabhau	T.R. Ghodake.

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Department of Microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Bacterial cytology and Physiology	100 %
2	B.Sc. II	Bacterial Genetics	100%

Sr.No.	Student Name	Signature of students
1	Atar Tammana	A.S. Atar.
2	Aware Pranali	Aware. P
3	Aware samarth	samarth. A
4	Aware suhag	Aware
5	Chaudhari ajay	Chaudhari A.
6	Chavan Pankaj	Chavan P.
7	Devkar Rani	Rani devkar.
8	Garad swapnil	S. Garad.
9	Gund Adesh	A. Gund.
10	Jadhav Kirti	Jadhav. K.
11	Jagtap Pritam	P.U. Jagtap.
12	Kamble swapnil	Kamble. S.
13	Kanade snehal	snehal. K.
14	Kapase Ajinkya	Ajinkya. K.
15	Kapase Tejaswini	Kapase. T.
16	Katkar Renuka	Renuka. K.
17	Londhe somnath	Londhe.
18	Mali pratiksha.	

Principal
Hemuji Chandele College
Shelgaon (R) Tal-Barshi Dist. Solapur

Head of the Department
Microbiology

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Immunology and Medical Microbiology	100 %
2	B.Sc. II	Industrial Microbiology	100%

Sr.No.	Student Name	Signature of students
1	Raddi Abhishek	Raddi A.
2	Salunke Vaibhav	V. S.
3	Sherkhare Pranita	PS.
4	Sherkhare Saraswati	SS.
5	Mohite Rajsingh	Mohite R.
6	Atar Tamanna	T. S. Atar.
7	Awase Pranali	Awase P.
8	Awase Samarth	Samarth. A.
9	Awase Sujay	Awase
10	Chaudhari Ajay	Chaudhari A.
11	Chavan Pankaj	Chavan. P.
12	Devkar Rani	Rani devkar.
13	Gorad Swapnil	S. Gorad.
14	Gund Adesh	A. Gund.
15	Jadhav Kirti	Jadhav. K.
16	Jagtap Pritam	P. V. Jagtap.
17	Kamble Swapnil	Kamble. S.
18	Kattar Renuka	Shelal. K.

Gojare.
Head of the Department
Microbiology

Gojare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist.

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of MICROBIOLOGY

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Introduction to Microbiology and Microbial diversity	100 %
2	B.Sc. I	Cell cytology and Microbial Tecniques	100%

Sr.No.	Student Name	Signature of students
1	Ghodake Trupti Rajabhau	T. R. Ghodake.
2	Alat Nikita Dattatraya	Alat.
3	Patil Vaishnavi Dayanand	Patil
4	Adsul samruddhi Pandurang	Samruddhi
5	Barbade Sakshi Basveshwar	Sakshi
6	Kashid sanika dadarao	Sanika
7	Bhosale komal pandhari	Komal P.B.
8	Patil Pratiksha Vijaykumar	Pratiksha.
9	Bhosale sakshi Navnath	Sakshi.
10	Mane Punam Bapu	Mane P.
11	Ghodake Sandhya Balasaheb	Ghodake.
12	Bhadole Nikita Mahesh	Nikita B.
13	Bhosale sankita Mohan	Bhosale
14	Ghodake Trupti Rajabhau	T. R Ghodake
15	Sirsat Ratnja Rohidas	R.R. Sirsat

Golare.
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Golare.
Head of the Department
Microbiology

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Microbial Metabolism And cultivation	100 %
2	B.Sc. I	Applied Microbiology	100%

Sr.No.	Student Name	Signature of students
01	Alat Nikita Dattatray	Alat
02	Patil Vaishnavi Dayanand	Patil
03	Adsul Sambhaji Pandurang	Sambhaji
04	Barbade Sakshi Baleshwar	Sakshi
5	Kashid Sonika dadarao	Sonika
6	~~Patil vaishnavi~~	
7	Bhosale Komal Pandhari	Komal P.B.
8	patil pratiksha vijaykumar	Patil
9	Bhosale sakshi Nathnath	Sakshi
10	Mane Punam Bapu.	mane P.
11	Ghodake Sandhya Balaheb	Ghodake
12	Bhoeble Nikita Mahesh.	Nikita B
13	Bhosale Sankita Mohan	SBhosale.
14.	Ghodake Trupti Rajabhau	T. R. Ghodake

Gojare.

Head of the Department
Microbiology

Gojare.

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Virology	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Barbade.
3	Gaikwad Kishor	Kishor. G.
4	Gavali Priti	P. R. Gavali
5	Kashid sonal	Kashid. S.
6.	Waghmare Prajwal.	Waghmare. P

Gopare.
Head of the Department
Microbiology

Gopare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Clinical Microbiology	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Barbade
3	Gaikwad Kishor	Kishor .G.
4	Gavali Priti	P.K.. Gavali
5	kashid Snehal	Kashid S.
6	Waghmare Prajwal.	Waghmare P.

Golare.
Head of the Department
Microbiology

Golare.
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Environmental Microbiology	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Ketuja	Badgude R.
2	Barbade Mrunal	Mbarbade.
3	Gaikwad Kishor	Kishor. G.
4	Gavali Priti	P. R. Gavali
5	Kashid Snehal	Kashid's.
6	Waghmare Prajwal	Waghmare. P
7		

Gotare.
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Gotare.
Head of the Department
Microbiology

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Microbial Biochemistry	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Barbade.
3	Gaikwad Kishor	Kishor. G.
4	Gavali Priti	P. R. Gavali
5	Kashid Snehal	Kashides.
6	Waghmare Prajwal.	Waghmare. P.

Golare.
Head of the Department
Microbiology

Golare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Microbial Genetics	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Mbarbade.
3	Gaikwad kishor	Kishor.G.
4	Gavali Priti	P.R Gavali
5	Kashid snehal	Kashid S.
6	Waghmare Prajwal.	Waghmare.P.

Golare.
Head of the Department
Microbiology

Golare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Industrial Microbiology	100 %

Sr.No.	Student Name	Signature of students
1	Waghmare Prajwal	Waghmare P.
2	Kashid snehal	Kashid. S.
3	Gaikwad Kishor	Kishor. G.
4	Barbade Mrunal	M. barbade
5	Badgude Rutuja	Badgude. R.
6	Gavali Priti	P. R. Gavali

Golare.
Head of the Department
Microbiology

Golare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Agriculture Micrtobiology	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Mbarbade.
3	Gaikwad Kishor	Kishor. G.
4	Gavali Priti	P. R. Gavali
5	Kashid Snehal	Kashid.S.
6.	Waghmare Prajwal.	Waghmare P.

Golare.

Head of the Department
Microbiology

Golare

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of microbiology

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. III	Immunology	100 %

Sr.No.	Student Name	Signature of students
1	Badgude Rutuja	Badgude R.
2	Barbade Mrunal	Mbarbade.
3	Gaikwad kishor	Kishor. G.
4	Gavali Priti	P. R. Gavali
5	Kashid Snehal	Kashid. S.
6.	Waghmare Prajwal	Waghmare. P.

Golare.
Head of the Department
Microbiology

Golare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Syllabus completion report 2021-22

Department of Computer Science

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I Sem-1	Fundamental of computer	100 %
2	B.Sc. I Sem-1	Programming using C	100%

Sr.No.	Student Name	Signature of students
1)	Parde Samarth Sanjai	S.S.P
2)	Kapase Samarth Kishor	
3)	Kurhade Mahesh Shankar	
4)	madre Aditya Babasaheb	
5)	Sathe onkar Tanaji	
6)	More Dnyaneshwar Mahadev	
Sr.No.	Student Name	Signature of students

Head of the Department
Computer Science
Syrwase. J.R.

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Syllabus completion report 2021-22

Department of Computer Science

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I Sem-2	Fundamental of computer web Technology	100 %
2	B.Sc. I Sem-2	Programming using C-II	100%

Sr.No.	Student Name	Signature of students
1)	Parde Samarth Sanjay	S.S.P
2)	Kapase Samarth Kishor	S.kapase.
3)	Kurhade Mahesh Shankar	
4)	Madre Adisagi Babasaheb	
5)	Sathe Onkar Tanaji	
6)	More Dnyaneshwar Mahadev	
Sr.No.	Student Name	Signature of students

Head of the Department
Computer Science

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Syllabus completion report 2023-24

Department of Computer Science

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc.II Sem-III	Data Structure	100 %
2	B.Sc. II Sem-III	Software Engineering	100%

Sr.No.	Student Name	Signature of students
1)	Parde Samarth Sanjay	S.S.P
2)	Kapase Samarth kishor	Skkapase
3)	Madre Aditya BuBasaheb	@bli.
4)	Kurhade Mahesh shankar	Mahesh
5)	Sathe onkar Tanaji	
6)	More dnyaneshwar Mahadev	
Sr.No.	Student Name	Signature of students

Head of the Department
Computer Science

Principal
Hemuji Chandele College

Syllabus completion report 2023-24

Department of Computer Science

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc.II Sem-III	Data Structure	100 %
2	B.Sc. II Sem-III	Software Engineering	100%

Sr.No.	Student Name	Signature of students
1)	Parde Samarth Sanjay	S.S.P
2)	Kapase Samarth kishor	Skkapase.
3)	Madre Aditya BaBasaheb	@bli.
4)	Kurhade Mahesh shankar	Mahesh M
5)	Sathe onkar Tanaji	
6)	More dnyaneshwar Mahadev	Dnyaneshwar.

Sr.No.	Student Name	Signature of students

Head of the Department
Computer Science
Surwase J. R.

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Syllabus completion report 2021-22

Department of Computer Science

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc.II Sem-IV	Core Java	100 %
2	B.Sc. II Sem-IV	DBMS Using Oracle	100%

Sr.No.	Student Name	Signature of students
1)	madre Aditya Babasaheb	Adi.
2)	Kapase Samarth Kishor	
3)	Kurhade Mahesh shankar	
4)	parde Samarth Sanjay	S. S. P
5)	Sathe onkar Tangji	
6)	More dnyaneshwar Mahadev	
Sr.No.	Student Name	Signature of students

Head of the Department
Computer Science
Surwase J. R.

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of Botany

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Plant Ecology	100 %
2	B.Sc. I	Taxonomy of Angiosperm	100%

Sr.No.	Student Name	Signature of students
1]	Komal Pandhari Bhosale	Komal P.B.
2]	pratiksha vijay patil	Patil..
3]	Pawar Aishwarya Bapurao	A.B. Pawar.
4]	Sirsat Rutuja Rohidas	R.R. Sirsat.
5]	Bhosale Sankita Mohan.	Bhosale...
6]	Ghodake Trupti Rajabhau.	T.R. Ghodake.
7]	Alat Nikita Dattatray	Alat
8]	Babade Sakshi Bhaveshwar	Sakshi
9]	Adsul Samruddhi Pandurang	Samruddhi
10]	Patil Vaishnavi Dayanand	Patil
11]	Kashid Sanika Dadarao	Sanika
12]	Bhadole Nikita Mahesh	Nikita.B
13]	Bhosale Sakshi Navnath	Sakshi.
14]	Sandhya Ghodke	Ghodake
15]	Pawar Saniya	Saniya Pawar

Saniya Pawar

Principal

Hemuji Chandele College

Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of Botany

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Fungi and Archegonite	100 %
2	B.Sc. I	Microbiology and Phycology	100%

Sr.No.	Student Name	Signature of students
1)	Komal Pandhari Bhosale	Komal P. B.
2)	pratiksha vijay patil	Patil.
3)	Pawar Aishwarya Bapurao	A. B. pawar
4)	Bhadole Nikita Mahesh	Nikita. B
5)	Sirsat Rutuja Rohidas	R. R. Sirsat
6)	Bhosale Sankita Mohan.	SBhosale.
7)	Ghodake Trupti Rajabhau.	T. R. Ghodake.
8)	Alat Nikita Dattatray	Alat.
9)	Adsul Samruddhi Pandurang	Samruddhi
10)	Patil Vaishnavi Devanand	Vpatil
11)	Barbade Sakshi Basveshwar	Sakshi.
12)	Kashid Sanika Dadarao	Sanika
13)	Bhosale Sakshi Navnath	Sakshi.
14)	Ghodke Sandhya	Ghodke
15)	Pawar Sanjya	Sanjya

Gotare
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Hemuji Chandele College, Shelgaon (R),
Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of Botany

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Plant anatomy	100 %
2	B.Sc. II	Plant Metabolism	100%

Sr.No.	Student Name	Signature of students
1)	Jagtap pritam umesh	P.U. Jagtap.
2)	Kanade Snehal Arun	Snehal A.K.
3)	Sherkhane Pranita Pavan	sherkhane. P.P.
4)	Raut Ankita Jeevan	A.J. Raut.
5)	Katkar Renuka Ramling	Katkar. R.R
6)	Jadhav Kirti shankar	K.S. Jadhav.
7)	Mali pratiksha kumar	P.K. mali.
8)	Kapase Tejaswini Sampat	T.S. Kapase
9)	shinde Divyarani Rajendra	D. R. shinde
10)	Aware Pranali Maharudra	
11)	Atar Tamanna sharn	T.S. atar
12)	Devkar Rani Angad	Rani
13)	Dige Rutuja Balasaheb	R.B. Dige.

Head of the Department
Botany

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of Botany

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Plant physiology	100 %
2	B.Sc. II	Embryology of Angiosperm	100%

Sr.No.	Student Name	Signature of students
1)	sherkhane. Pranita Pavan	sherkhane-P.P.
2)	Raut Ankita Jeevan	A.J.Raut
3)	Kandde snehal Arun	Snehal A.K
4)	Katkar Renuka Ramling	Katkar. R.R
5)	Jagtap pritam umesh	P.U.Jagtap.
6)	Jadhav Kirti shankar	K.S.Jadhav.
7)	kapase Tejaswini Sampat	T.S.kapase
8)	Malp pratiksha kumar	p.k.malli
9)	shinde Divyasani rajendra	D.R.shinde.
10)	Aware Pranali Maharudra	
11)	Atar Tamanna sharn	T.S.atar
12)	Devkar Rani Angad	Rani
13)	Dige Rutuja Balasaheb	R.B.Dige.

Jadhav.P.
Head of the Department
Botany

Golar.
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

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Syllabus completion report AY 2022-23

Department of Botany

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Plant anatomy	100 %
2	B.Sc. II	Plant Metabolism	100%

Sr.No.	Student Name	Signature of students
1)	Jagtap pritam umesh	P.U. Jagtap.
2)	Kanade Snehal Arun	Snehal A.K
3)	Sherkhane Pranita Pavan	Sherkhane. P.P.
4)	Raut Ankita Jeevan	A.J. Raut.
5)	Katkar Renuka Ramling	Katkar. R.R
6)	Jadhav Kirti shankar	K.S. Jadhav.
7)	Mali pratiksha kumar	P.K. mali.
8)	Kapase Tejaswini Sampat	T.S. Kapase
9)	shinde Divyatani Rajendra	D. R. shinde
10)	Aware Pranali Maharudra	
11)	Atar Tamanna sharn	T.S. atar
12)	Devkar Rani Angad	Rani
13)	Dige Rutuja Balasaheb	R.B. Dige.

Jadhav P.

Head of the Department
Botany

Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

SYLLABUS COMPLETION REPORT AY 2022-23

MR. NARENDRA NANASAHEB GHODAKE

Assistant professor in zoology, dep. of zoology

Hemuji chandele college shelgaon (r).

As per the teaching plan AY. 2022-23, I have completed assigned syllabus.

SEMISTER FIRST

Sr, No	CLASS	COURSE NAME	SYLLABUS COMPLETED (%)
1	B.Sc-I	ANIMAL DIVERSITY - I	100 %
2	B.Sc-I	ANIMAL DIVERSITY - II	100 %

Student Name	Signature of student
1) Adsul Samruddhi Pandurang	Samruddhi
2) Bhosale Komal Pandhari	Komal P.B.
3) Bhadale Nikita Mahesh	Nikita B
4) Bhosale sakshi Navnath	[illegible]
5) Barbade Sakshi Basveshwar	Sakshi
6) Pawar Saniya Durgappa	Saniya
7 Mahe Punam Bapu	Mahe
8) Sapate Kadambari Ravindra	K.R Sapate
9) Ghodake Sandhya Balasaheb	Ghodake
10) Alat Nikita Dattatray	Alat
11) Pawar Aishwarya Bapurao	A.B. Pawar
12) Patil Pratiksha Vijaykumar	Patil
13) Mali Sanyukta Ashok	S.A. Mali
14) Ghodake Trupti Rajabhau	T.R. Ghodake
15) Bhosale Sankita Mohan	Bhosale
16) Kashid Sanika Dadarao	Sanika
17) Patil Vaishnavi Dayanand	Patil

Madhuri
Head of the Department
Zoology

Ghodake N.N.
10/12/2022
Narendra Ghodake
Head of Department
Head of the Department
Zoology

SYLLABUS COMPLETION REPORT AY 2022-23

MR. NARENDRA NANASAHEB GHODAKE

Assistant professor in zoology, dep. of zoology

Hemuji chandele college shelgaon (r).

As per the teaching plan AY. 2022-23, I have completed assigned syllabus.

SEMISTER FIRST

Sr, No	CLASS	COURSE NAME	SYLLABUS COMPLETED (%)
1	B.Sc. - I	ANIMAL DIVERSITY - I	100 %
2	B.Sc. - I	ANIMAL DIVERSITY - II	100 %

Student Name	Signature of student
Adsul Samruddhi Pandurang	Samruddhi
Bhosale Komal Pandhari	Komal P.B.
Bhodale Nikita Mahesh	Nikita.B
Bhosale Sakshi Navnath	Sakshi
Barbade Sakshi Basveshwar	Sakshi
Pawar Saniya Durgappa	Saniya.
Mane Pritam Bapu	Mane P.R
Sapate Kadambari Ravindra	Sapate
Ghodake Sandhya Balasaheb	Sandhya
Alat Nikita Dattatray	Alat
Pawar Aishwarya Bapurao	A.B. Pawar.
Patil pratiksha vijaykumar	Patil.
Mali Sanyukta Ashok	S.A.Mali
Ghodake. Trupti Rajabhau	T.R.Ghodake.
Bhosale Sankita Mohan.	Bhosale.
Kashid Sanika Dadarao	Sanika
Patil Vaishnavi Dayanand	Vpatil

Ghodake. N.N
10/12/2022.
Narendra Ghodake

Head of Department

Head of the Department
Zoology

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of Mathematics

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Algebra	~~100~~ %
2	B.Sc. I	Calculus	100%

Sr.No.	Student Name	Signature of students
1)	Parde Samarth Sanjay	S.S.P
2)	More Dnyaneshwar Mahadev	
3)	Kurhade Mahesh shankar	
4)	Kapase Samarth kishor	
5)	madre Aditya Babasaheb	
6)	Navgude Anjali Tukaram	Navgude.A.T
7)	Rode Vaishnavi Sarjerao	
8)	Bhosale Vaishnavi Dipak	V.D.Bhosale
9)	Gaikwad Akanksha Appasaheb	
10)	Donge Sandhya Ishwar	Donge.S.I
11]	Sathe onkar Tanaji	
11]	Zendage Vishal Vitthal	Zendage

Head of the Department
Mathematics

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Department of Mathematics

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. I	Geometry	100 %
2	B.Sc. I	Differential Equation	100%

Sr.No.	Student Name	Signature of students
1]	Parde samarth Sanjai	S.S.P
2)	More dnyaneshwar Mahadev	
3)	Kurhade mahesh shankar	
4]	Kapase samarth kishor	
5]	madre Aditya Babasaheb	
6)	Gaikwad Akanksha Appasaheb	
7)	Dange Sandhya Ishwar	Dange . S. I
8)	Navgude Anjali Tukaram	Navgude . A . T
9]	Bhosale Vaishnavi Dipak	V. D. Bhosale
10)	Rode Vaishnavi Sarjerao	
11]	Sathe onkar Tanaji	
12]	Zendage vishal vitthal	

Head of the Department
Mathematics

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Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of Mathematics

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Differential Calculus	100 %
2	B.Sc. II	Laplace Transform	100%

Sr.No.	Student Name	Signature of students
1)	Dhengale Om Pramod	
2)	Bhosale Bhakti Jamburvant	
3)	Havaldar Muskan Husen	

Head of the Department
Mathematics

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Syllabus completion report AY 2022-23

Department of Mathematics

Sr.No.	Class	Course Name	Syllabus Completed
1	B.Sc. II	Differential Equation	100 %
2	B.Sc. II	Abstract Algebra	100%

Sr.No.	Student Name	Signature of students
1)	Dhengale Om Pramod	
2)	Bhosale Bhakti Jambuvant	
3)	Havaldar Muskan Husen	

Head of the Department
Mathematics

SYLLABUS COMPLETION REPORT AY 2022-23

Miss. Priyanka Atul Dindore

Department of physics

Hemuji chandelle college, shelgaon R

As per the teaching plan ay 2022-23, I have completed assigned syllabus.

Semester first

Sr.no.	Class	Paper name	Syllabus completed (%)
1	B.sc I	• Mechanics and properties of matter • optics	100 %
2	B.Sc II	• General physics heat and sound • electronics	100%

Student name	Class	Signature of student
Navgude Anjali	B.sc-I	Navgude.A.T
Rode Vaishnavi	B.sc-I	Rode.
Bhosale Vaishnavi	B.sc-I	V. D. Bhosale
Gaikwad Akanksha	B.sc-I	
Dange Sandhya	B.sc-I	Dange S.I
Madre Aditya	B.sc-I	
Kapase Samarth	B.sc-I	
Zendage Vishal	B.sc-I	
More Dnyaneshwar	B.sc-I	
Parade Samarth	B.sc-I	S.S.P.
Kyrhade Mahesh	B.sc-I	
Sathe onkar	B.sc-I	

Priyanka
Head
Department of Physics
(Dindore P.A.)

Head of the Department
Physics

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Using ICT Tools

PPT Presentation Of Zoology

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Using ICT Tools

PPT Presentation Of Physics

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Using ICT Tools

Video Lecture of Microbiology

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Using ICT Tools

PPT Presentation Of Chemistry

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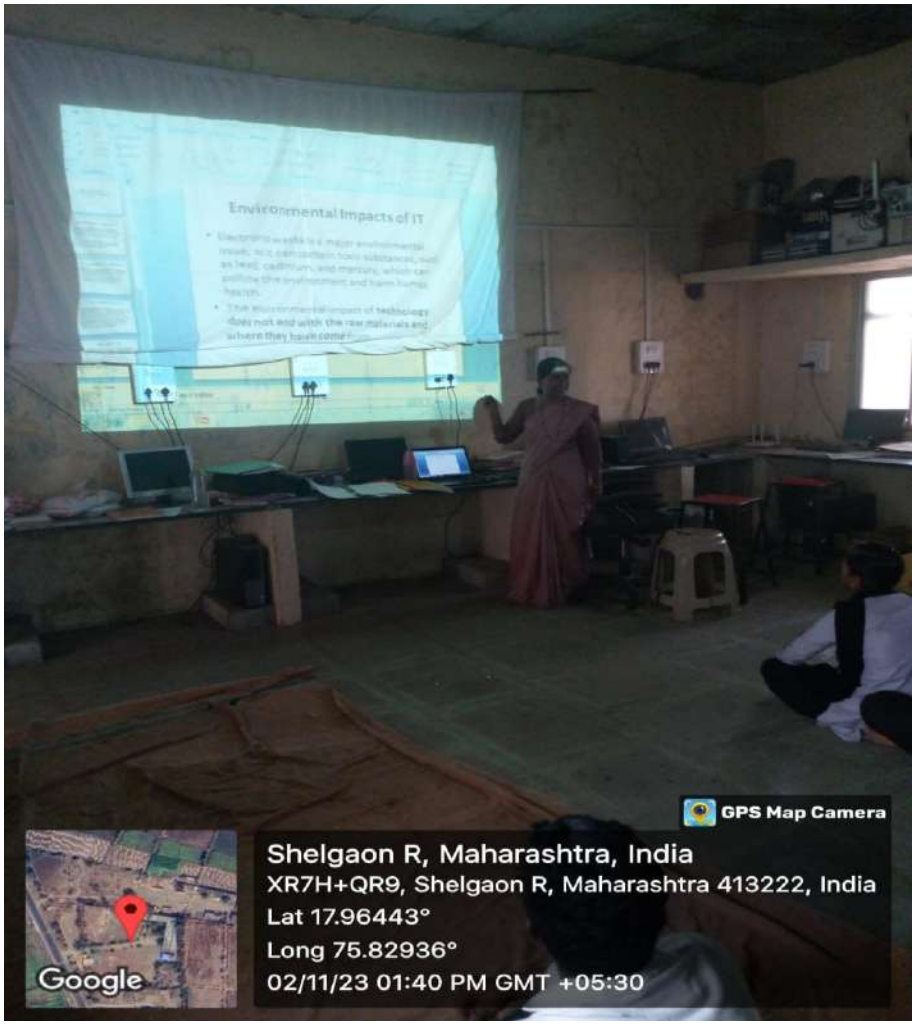
Using ICT Tools

PPT Presentation of Computer Science



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Using ICT Tools

PPT Presentation of Mathematics

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Using ICT Tools

PPT Presentation of Botany

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Participative Learning
Seminar of Chemistry

Seminar Of Computer Science

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Seminar of Microbiology

Seminar Of Mathematics

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Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Notice

Date-

All the students hereby informed to attend the first meeting of Mentor – Mentee on Saturday ,24 Augast, 2023 at 9.00 am at science section as per list enclosed here with. If you have doubts do contact Mentor, Miss. Urade P.N. Mobile no. 9860220146

College no. 8999796493

Name of Mentor: Miss Urade P.N.

Department of Microbiology

List of student allotted as Mentee

Sr.no.	Student name	Phone no.	Sign
1	Aware Gauri Panurang	950325801	G. P. Aware
2	Baraskar Srushti Gorakh	9673263419	S. G. Barkar.
3	Barbole Gayatri Gopal	9359673179	Gayatri B.
4	Chaudhari Monali Devikas	7083257061	Monali D. C.
5	Deshmukh Samrudhi Sudhir	8788148572	S. S Deshmukh.
6	Gund Priti Balasaheb	7559497415	Gund. P.
7	Jadhav Anisha Balasaheb	9881972975	J. A. B.
8	Mali swapnali sanjay	8308212458	S. S Mali
10	Mane tanuja kumar	8265016215	Mane T. K.
11	More bharati ganesh	8468938405	M. B. G.
12	Nannaware priya namdev	9834043340	Priya N. N.
13	Nannaware vaishnavi dattatray	9970780436	V. D. N.
14	pawar pragati laxman	9172695704	Pawar. P.
15	Shelake Samiksha Suresh	9322396557	–
16	Shinde Kiran Bharat	8308930993	Kiran
17	Sutar Soniya Dattatraya	9356905669	Sutars.

Gpotare.

Head of Department

Microbiology

Gpotare.

Principal

Hemuji Chandele College

Shelgaon(R) Tal-Barshi Dist-Solapur

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

NOTICE

DATE 24/08/23

All the students hereby informed to attended the first meeting of mentor –mentee on Saturday 24 augest 2023 at 9.00 am at science as per list enclosed here with if you have doubts do contact mentor

Nagtilak Rupali

MOBILE .NO .9665135905

NAME OF MENTOR :Nagtilak rupali DEPT OF Mathematics

LIST OF STUDENTS ALLOWED AS MENTEE

CLASS	STUDENT FULL NAME	MOBILE .NO	SIGNATURE
B.SC I	Kambale Amruta Gautam	7276122874	Kamble.A.G
B.SC I	Dalavi Anjali Bhausaheb	9096436012	A.B.Dalavi
B.SC I	Mote swaranjali Ramraje	9067134895	S.R.mote
B.SC I	Kadam Sayali Bharat	7773982090	–
B.SC I	Disale Rutuja Rameshwar	9075187481	R.B.Disale.
B.SC I	Shaikh simran Mubarak	9146972497	Shaikh
B.SC I	Aware Nisha Sudhakar	9075392010	N.S.Aware.
B.SC I	Aware Swati Mohan	9021212891	Aware.S.M.
B.SC I	Jadkar Puja Dattatray	8329185673	P.D.Jadkar.
B.SC I	Kapase Vaishnavi Vilas	8329185673	–
B.SC I	Saravale Punam Parshuram	9529664016	Saravale
B.SC I	Davane Balaji Ashok	9921539728	B.A.Davane.
B.SC I	Chavan Mayuri Vilas	7666700064	M.Chava.
B.SC I	Melage Prajakta Satyawan	9834727027	–

Gotare.
Principal
Hemuji Chandele College
Shelgaon(R) Tal-Barshi Dist-Solapur

Pupalj.
Head of the Department
Mathematics

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Tuljabhavani Mahila Mandal's

Hemuji Chandele College, Shelgaon (R),

Tal. Barshi, Dist. Solapur (Maharashtra) 413222

Notice

Date-

All the students hereby informed to attend the first meeting of Mentor – Mentee on Saturday ,24 Augast, 2023 at 9.00 am at science section as per list enclosed here with.

If you have doubts do contact Mentor, Miss. Surwase J.R. Mobile no. 8080891792

College no. 8999796493

Sr. No.	Name of students	Mobile No.	Sign.
1	Maske Nikita Dnyaneshwar	9527864326	Maske N D
2	Bhosale Bhaki Janbuvant	8767452220	Bhosale
3	Lokhande Sakshi Madhukar	9673154299	Lokhande
4	Dhengale Om Pramod	9307430547	
5	Dongare Dattatray Ambadas	8010643389	Dongare
6	Mote Sarang Vishnu	8668650700	S.V. Mote
7	Mote Sunil Laxman	9325280169	Mote S.L.
8	Kade Om Sharad	7666295039	Kade
9	Magar Rutuja Dhannaji	7758920881	Magar
10	Mane Nikita Tukaram	9158046417	N.T. Mane
11	Sathe Suyash Shahaji	8857845561	Sathe S.S.
12	Jadhav Krushnat Ramchandra	9359841292	Jadhav K R.
13	Kapase Rushikesh Sampat	7264980469	

Gotare

Principal

Hemuji Chandele College

Shelgaon(R) Tal-Barshi Dist-Solapur

Mentor-Mentee committee (Academic Year 2022-23)

ame of the mentor - Dindore Priyanka Atul

epartment of Physics

lob.No. 9284492095

List of Student allotted as Mentee

Class	Roll No.	Student Full Name	Mobile	Signature
B.Sc I		Gaikwad Akanksha Appasaheb	8805422200	Akanksha.
B.Sc I		Navgude Anjali Tukaram	9689655808	Navgude.A.T
B.Sc I		Kurhade Mahesh Shankar	9529296373	Mahesh
B.Sc I		Kapase Samarth Kishor	9022207314	Skapase
B.Sc I		Dange Sandhya Ishwar	9922790527	Dange S.I
B.Sc I		Bhosale Vaishnavi Deepak	7744019066	V.D.Bhosale
B.Sc I		Rode Vaishnavi Sarjerao	8767790056	Rode.
B.Sc I		Madre Aditya Babasaheb	7776985610	Madre.
B.Sc I		Parade Samarth	9356083316	P.Samarth
B.Sc I		More Dnyaneshwar	8767712141	Dnyaneshwar
B.Sc I		Sathe Onkar Tanaji	9011514090	Onkar
B.Sc II		Lokhande Sakshi Madhukar	9673154299	Sakshi
B.Sc II		Maske Nikita Dnyaneshwar	9527864326	Nikita
Sc II		Havaldar Muskan Hussain	8010285700	Muskan.
Sc II		Bhosake Bhakti Jambuvant	8767452220	Bhakti Bhosale