Punyashlok Ahilyadevi Holkar Solapur University, Solapur

NAAC Accredited-2022
'B++'Grade (CGPA2.96)

Name of the Faculty: Science &Technology

(As per New Education Policy 2020)

Syllabus: **Pharmaceutical and fine Chemical Technology**

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

(Syllabus to be implemented from June 2024)

Structure as per NEP-2020

B. Sc. I (Pharmaceutical and fine Chemical Technology)

Level	Sem	Major		VSC/ SEC	OE/GE	IKS	CC	Total Credits	Cumulative Credits
		T	P						
4.5	I	2	2	SEC1-2	---	L1- 2 IKS(General) 2 VEC 1-2	CC1-2	22	44
		2	2						
		2	2						
	II	2	2	SEC2 -2	OE1 /GE1- 2	L2-2 VEC 2	CC2-2	22	
		2	2						
		2	2						

S.No.	Course Type	Paper Title	Credit
1.	Major	Chemistry-I	2
2.	Practical based on DSC1-1	Practical Lab – I	2
3.	Major	General Physics	2
4.	Practical based on DSC2-1	Practical Lab – I	2
5	Major	Basics in Microbiology	2
6.	Practical based on DSC3-1	Practical Lab – I	2
7.	SEC-1	Chemical Industries-I	2
8.	IKS	General IKS	2
9.	AEC	English	2
10	VEC	Constitution of India	2
11	CC1	CC	2
		Total	**22**
12	Major	Chemistry-II	2
13	Practical based on DSC1 -2	Practical Lab - II	2
14.	Major	General Mathematics	2
15	Practical based on DSC2-2	Practical Lab – II	2
16.	Major	Introduction to fine Chemicals	2
17	Practical based on DSC3-2	Practical Lab – II	2
18.	OE-I/GE-I	Computer for Chemist	2
19	SEC	Chemistry Computer Skill Enhancement Course	2
20	AEC	English	2
21	VEC	Environmental Studies	2
22	CC2	CC	2
		Total	**22**

Abbreviations:

OE: Generic/ Open Electives
VSEC: Vocational Skill and Skill Enhancement Courses
SEC: Skill Enhancement Courses
AEC: Ability Enhancement Courses
FP: Field projects
CC: Co-curricular Courses
RP: Research Project
IKS: Indian Knowledge System

Semester I

Semester I

DSC 1-1

Title of the paper: Chemistry- I

Credit: 02, Theory: 30 Periods, Marks: 50

	Course Objectives:
•	To achieve knowledge of the gaseous states such as ideal and non-ideal gases, isotherm, and liquefaction of gases.
•	To acquire knowledge about rates of chemical reactions and distinguishing the reaction of a different order and their characteristics.
•	To proper understanding of covalent bonding using VBT and MOT approach.
•	To acquire knowledge of quantum mechanics, shapes of orbitals and periodic properties.

Unit 1:	
A	**Gaseous State** **(07)**
1.1	Ideal and Nonideal 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.
1.2	Critical Phenomena: PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.
1.3	Liquefaction of gases, Joule-Thomson effect.
1.4	Numerical Problems
B	**Chemical Kinetics** **(08)**
2.1	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.
2.2	Order and Molecularity of reaction.
2.3	First order reaction: Derivation of Rate constant, Characteristics of first order reaction, Example: Decomposition of N_2O_5
2.4	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
2.5	Pseudo-uni-molecular reaction, Example: Hydrolysis of methyl acetate in presence of an acid.
2.6	Numerical Problems

Unit 2:	
A	**Covalent bonding: Valence Bond Theory (VBT) approach (07)**
3.1	Types of chemical bonds
3.2	Valence Bond Theory: Heitler–London Theory and Pauling-Slater Theory: Merits and Demerits
3.3	Need of Hybridization with respect to $BeCl_2$, BF_3, $SiCl_4$
3.4	Types of hybridization and shapes of simple inorganic molecules: PCl_5, SF_6
3.5	Valence Shell Electron Pair Repulsion (VSEPR) Theory w.r.t. NH_3, H_2O
B	**Covalent bonding: Molecular Orbital Theory (MOT) approach (08)**
4.1	Atomic and Molecular orbitals.
4.2	L.C.A.O. Principle
4.3	Bonding, Antibonding and Nonbonding Molecular orbitals.
4.4	Conditions for successful overlap
4.5	Different types of overlap (s-s, s-p_x, p_x-p_x and p_y-p_y or p_z-p_z)
4.6	Energy level sequence of molecular orbitals for n=1and n =2
4.7	M.O. Diagrams for: a) Homonuclear diatomic molecule. H_2,Li_2,Be_2,C_2,N_2 and O_2 b) Heteronuclear diatomic molecules CO and NO w.r.t. bond order, stability and magnetic properties.
	Course Outcomes:
CO1:	Get a better understanding of gaseous state.
CO2:	Understand the significance of rates of chemical reactions.
CO3:	Explain the deviations of gases from ideality
CO4:	Describe the hybridization concept
CO5:	Construct the MO diagrams for simple molecules
CO6:	Understand different types of orbitals
	Reference books:
1.	Chemical Kinetics by K.J. Laidler, Tata McGraw Hill Publishing Co. New Delhi.
2.	Physical Chemistry: S. Glasstone.
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.	Physical Chemistry Through problems: Dogra and Dogra (Wiley Eastern Ltd.,)

7.	Physical Chemistry: G. M. Barrow(Tata McGraw Hill)
8.	Essentials of Physical Chemistry: B.S. Bahl & G.D.Tuli (S. Chand)
9.	Principles of Physical Chemistry: B.R. Puri, L.R. Sharma and M.S. Patania, S.L.N. Chand & Co.1987
10.	Kinetics and Reaction Mechanisms by Frost and Pearson, Wiley, New York.
11.	University General Chemistry: C N R. Rao (McMillan)
12.	Advanced Inorganic Chemistry-Cotton and Wilkinson
13.	Inorganic Chemistry-J.E. Huheey
14.	Concepts and models of Inorganic Chemistry-Douglas & Mc-Daniel
15.	Principles of Inorganic Chemistry-Puri, Sharma
16.	New Concise Inorganic Chemistry-(ELBS)-J.D.Lee
17.	Textbook of Inorganic Chemistry- P.L.Soni
18.	Advanced Inorganic Chemistry-Satyaprakash, Tuli, Basu
19.	Theoretical Principles of Inorganic Chemistry-G. S. Manku
20.	Principles of Inorganic Chemistry-Puri, Sharma & Kalia
21.	Inorganic chemistry: Principles of structure and reactivity–J.E. Huheey
22.	Advanced Inorganic Chemistry, Vol.I– Gurudeep Raj
23.	A New Guide to Modern ValencyT heory- G. J.Brown

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Semester I

Title of the paper: Chemistry Practical Lab I

Credit: 02, Practical: 60 Periods, Marks: 50

	Course Objectives:
●	To develop practical skills in basic and conceptual Physical Chemistry.
●	To gain practical knowledge by applying the experimental methods to correlate with the theory.
●	To prepare students to determine rates of chemical reactions.
●	To develop students to learn measuring skills in practical.

●	To apply the analytical techniques and graphical analysis to the experimental data
	List of Experiments
Sr. No.	**Name of the Practical**
	Physical Chemistry (Any two from Chemical Kinetics,)
1.	Study of specific reaction rate of hydrolysis of methyl acetate in presence of HCl.
2.	Study of specific reaction rate of hydrolysis of methyl acetate in presence of H_2SO_4
3.	Study of reaction between $K_2S_2O_8$ and KI (Equal Concentrations)
4.	Determination of equivalent weight of Mg by Eudiometer.
5.	Determination of heat of ionization of weak acid.
	Inorganic Chemistry **Inorganic Quantitative Analysis:** Volumetric Analysis (Any two)
1.	To prepare a standard solution of Oxalic acid and determine the strength of Sodium hydroxide solution in terms of normality and Kg/dm^3
2.	To prepare a standard solution of Oxalic acid and determine the strength of Potassium permanganate solution in terms of normality and Kg/dm^3
3.	To prepare standard solution of Potassium dichromate and determine strength of Ferrous Ammonium Sulphate solution in terms of normality and Kg/dm^3 (Use internal indicator)
	Inorganic preparation:
1.	Preparation of ferrous ammonium sulphate
2.	Preparation of sodium cuprous thiosulphate
	Course Outcomes:
•	On successful completion of this practical course student will be able to:
●	handle various instruments.
●	correlate theoretical concepts with experiments.
●	develop awareness of minimizing errors.
●	develop basic skills of measurements
●	understand the theoretical principles of basic Practical chemistry.
●	**Any relevant practical's can be taken**
	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.	

DSC 1-2 Title of the paper: Mechanics and Properties of Matter

Credit: 02, Theory: 30 Periods

Course Objectives

- **Learn about the rotational motion and Moment of Inertia of the body and evaluate Moment of Inertia of various bodies.**
- **Absorb knowledge about different types of pendulums and evaluate acceleration due to gravity.**
- **Gain knowledge about the elasticity of body and study the elastic properties of a the body.**
- **Acquire the knowledge of the mechanical properties of fluids and evaluate it.**

Unit 1 Moment of Inertia (5hr)

Review of Moment of Inertia ,(Moment of Inertia of Fly wheel Moment of Inertia of Circular disc Moment of Inertia of Rectangular lamina Problems

Unit 2 Pendulums and Oscillations (5hr)

Introduction Theory of compound pendulum Bar pendulum. Kater's pendulum Bifilar pendulum (parallel suspensions of equal lengths) Elasticity **Torsional Pendulum Problems**

Unit 3 Elasticity (7 hr) Torsional Pendulum Problems Review of Elasticity Poisson's ratio of rubber tube (Theory and experimental method), Equivalence of shear strain to compression and extension strains ,Determination of Y of rectangular thin bar loaded at the center ,Rigidity of a wire by torsional oscillations, Problems

Unit 4 Surface Tension (7 hr)

Review of Surface Tension 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

Unit 5 Viscosity (6 hr)

Applications of Surface Tension Problems, Introduction , Newton's law of viscosity Streamline and turbulent flow Energy possessed by liquid Critical velocity and Reynolds number Equation of continuity Poiseuille's equation, Bernoulli's theorem and its applications to 1) Venturimeter 2) Automiser, Factors affecting on viscosity

Course Outcomes

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

- Understood M. I. of the body and evaluate it.
- To get knowledge about different types of the pendulums and evaluate acceleration due to gravity.
- Gain knowledge about the elasticity of body and study the elastic properties of a body.
- To gain the knowledge about the mechanical properties of fluids.

Reference books

1. Properties of matter- D.S. Mathur

2. A Text book of properties of matter- N.S. Khare & S. Kumar Physics Vol.I – David & Robert Resnick

3 University Physics-Mechanics of a particle- Anvar Kamal

4. Mechanics Berkeley Physics course, V.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.

5. Concepts of Physics: H.C. Varma, Bharati Bhavan Publisher

Practical based on DSC1-1 Title of the paper: Physics Practical Lab I

Credit: 02, Practical: 60 Periods

Course Objectives

- To develop practical skills in basic and conceptual Physics.
- To gain practical knowledge by applying the experimental methods to correlate with the theory.
- To prepare students to determine Moment of Inertia and acceleration due to gravity. To develop students to learn measuring skills in practical.
- To apply the analytical techniques and graphical analysis to the experimental data

Name of the Practical

1. L. C. of various measuring instruments
2.. Torsional pendulum
3. Bar pendulum
4. Bifilar pendulum
5. Moment of Inertia of disc by annular ring
6. Surface Tension by liquid drop method

7. . Poisson’s ratio
8. Viscosity by Stoke’s method
9. Viscosity of water by Poiseuille’s method
10. Moment of Inertia of a Flywheel.

DSC 3-1 Basics in Microbiology

Credit: 02, Theory: 30 Periods

Course Objectives

- Students will know the historical contributions of scientists for the development of subject
- To create awareness in learners about the scope of the subject in modern era.

Unit No.I: History, Scope and Branches of Microbiology 15 hr

A. Historical Background:

a) Contribution of Robert Hooke, 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: (Water, Air, Agriculture, Food and Dairy, Environmental, Medical, Industrial, Geomicrobiology, Space Microbiology)

b) National Institutes related to Microbiology in India–NIV, NARI, NCCS, CCMB, Serum Institute of India, Vasantdada Sugar Institute, National Research center on Pomegranate (NRCP). IMTECH (Institute of Microbial Technology, Chandigarh), Agharkar Research Institute, Pune, NIN Hydrabad.

Unit-II: Microbial Diversity 15 hr

A) Concept of prokaryotic and eukaryotic cell

B) General Characteristics of Microorganisms

i) Bacteria (Size, Shape and Arrangement) ii) Mycoplasma iii) Rickettsia iv) Actinomycetes v) Algae vi) Fungi vii) Viruses

C) Structure and Functions of Bacterial Cell:

i) Cell wall - Gram-positive and Gram-negative bacteria, sphaeroplast and protoplast

ii) Composition and functions of Cell membrane, Mesosome, Capsule, slime layer, Flagella and Pili

iii) Cytoplasm-Ribosome and nucleoid

D) Bacterial Taxonomy - a) Basic principles of Nomenclature

b) Criteria for bacterial classification and identification–Morphological, Cultural and Biochemical Characteristics

Course Outcome:

1) Students will know the evolution of the microbiology subject.

2) Students will understand the applied branches of microbiology and scope of microbiology.

3) Students will be able to understand diversity amongst microorganisms.

4) Understand beneficial and harmful effects of microorganisms in different fields of Microbiology

DSC 1-1 Basics in Microbiology (Practical)

Credit: 02, Practical: 60 Periods

1. Good microbiology laboratory practices and Biosafety

2. Principle, working and applications of Common laboratory instruments -

a) Autoclave

b) Hot Air Oven

3. Principle, working and applications of Common laboratory instruments -

a) Incubator

b) Colony Counter

4. Principle, working and applications of Common laboratory instruments -

a) PH Meter

b) Laminar Air flow

c) Water Bath

5. Handling and Care of compound Microscope

6. Monochrome staining

7. Negative staining

8. Gram staining

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

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

11. 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

12. Study of inoculation techniques – Broth, Slant, Stab, Spot.

13. Study of inoculation techniques –Spread and Streak.

14. Study of inoculation techniques –Pour plate.

15. Study of morphology of fungi by Mounting method –

(a) Aspergillus (b) Rhizopus (c) Penicillium (d) Mucor

Semester I

SEC1: Chemistry Skill Enhancement Course I

(Chemical Industries)

Credit: 02, Practical: 60 Periods, Marks: 50

	Course Objectives:
●	Realize a manufacturing of various inorganic and organic chemicals.
●	Comprehend the process flow diagram and various process parameters.
●	Understand and identify to solve problems arising during production
●	To develop students to learn measuring skills in practical.
Unit I	
A	**Cement Industry**
1.	Introduction; Classification and Manufacturing processes of Cement and Lime;
2.	Setting and Hardening process.
B.	**Petrochemicals**
1	Crude oil, Natural gas, Petroleum hydrocarbons- Types and source of crude oil;
2.	Refining various petroleum fractions- Thermal cracking, Recycle cracking, Thermal cracking of fuel
3	outline of chemicals derived from natural gases/ paraffin hydrocarbon-Ethylene, Propylene
Unit II	
A	**Metallurgy Industry**
1	Extraction and applications of metal alloys
2	Iron and steel
B.	**Nitrogen Industries:**
1	Manufacture of Urea, calcium cyanamide,
2	ammonium nitrate, nitric acid.
C	**Metal finish technology:**
1	Electro refining of metals
2	electroplating of nickel, chromium, copper, cadmium, silver and Gold

3	surface treatment technology, surface coats.
	Course outcome
	Realize a manufacturing of various inorganic and organic chemicals.
	Comprehend the process flow diagram and various process parameters.
	Understand and identify to solve problems arising during production
	Reference books
1	Lowenheim F A (1974) Modern Electroplating III Ed Chapman & Hall, Landon.
2	Gable, D: Principal of metal Treatment and protection. Pergamon, Press Oxford (1978)
3	R.R.Iash: a formulary of paints and other coating Vol. I
4	J.D. Gilchrist: Extraction Metallurgy (Pergamon)
5	Clausen, Mattson: Principle of Industrial Chemistry
6	F.A. Lowenheim & M.K. Moran: Industrial Chemicals

Semester I

IKS (General)

Title of the paper: IKS General

Credit: 02, Theory: 30 Periods, Marks: 50

Semester I

(CC1)

Title of the paper: CC

Credit: 02, Theory: 30 Periods, Marks: 50

NCC/NSS/Sports/Cultural/MOOCS/SWAYAM/YOGA/Health and Wellness

Semester II

Semester II

DSC 1-2

Title of the paper: Chemistry-II

Credit: 02, Theory: 30 Periods, Marks: 50

	Course 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 3 D structures of organic compounds.

•	To study the unsaturated and alicyclic compounds.
•	To study the concept of aromaticity, its applications and reactions.
•	To know the important physical properties of liquids like viscosity, surface tension and refractive index.
•	To gain knowledge of ionic bonding and ionic solids.
•	To proper understanding of covalent bonding using VBT and MOT approach.
Unit 1:	
A	**Fundamentals of organic reaction mechanism (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 bonds 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)
B	**Structure and Bonding (05)**
2.1	Hybridization:sp^3,sp^2ands p 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,
2.6	Hyperconjugation w.r.t. toluene
2.7	Steric effect w.r.t. mesitoic acid
C	**Stereochemistry of organic compounds (05)**
	Types of stereo-isomerism: Optical isomerism, Geometrical isomerism and Conformational isomerism
	Opticalactivity
	Essential conditions for Optical activity i. Elements of symmetry ii. Chiral center rw.r.t. lactic acid
	Optical isomerism in lactic acid and tartaric acid
	Enantiomers and diastereoisomers w.r.t. 2,3-dihydroxybutanoic acid

	Racemic modification.
Unit 2:	
A	**Physical properties of liquids (10)**
4.1	Introduction, additive and constitutive properties
4.2	Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer
4.3	Surface tension: -Determination of surface tension by Drop–Weight method
4.4	Refractive index, Snell's law
4.5	Specific and molecular refractivity, Abbe's refractometer: Critical angle Principle, construction, working and advantages
B	**Ionic Solids (05)**
5.1	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
5.2	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.
C	**Qualitative and Quantitative Analysis (06)**
6.1	Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur
6.2	Quantitative analysis of- - Carbon and hydrogen by Combustion method - Nitrogen by Kjeldahl's method - Halogen and Sulphur by Carius method.
6.3	Determination of molecular weight of an acid by titration method.
6.4	Empirical formula and molecular formula determination.
6.5	Numerical Problems
	Learning Outcomes:
•	CO1: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
•	CO2: Able to predict the reactivity of organic molecules by the help of electronic effects.

•	CO3: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
•	CO4: Understand the basic physical properties
•	CO5: To acquaint with instruments like refractometer, stalagmometer and viscometer
•	CO6: Explain ionic bonding and different parameters of crystal structure.
	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.BahlandArunBahl
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
15	Svehla, G.Vogel's Qualitative Inorganic Analysis,Pearson Education,2012.
16	Mendham,J.Vogel's Quantitative Chemical Analysis,Pearson,2009.
17	Harris, D.C. Quantitative Chemical Analysis,W.H. Freeman.
18	Dean, J.A. Analytical Chemistry Notebook, McGraw Hill.
19	Day, R.A. & Underwood, A.L. Quantitative Analysis, Prentice Hall of India
20	Gurudeep R Chatwal, Sham K Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
21	Barrow, G.M. Physical Chemistry Tata McGraw Hill (2007).

Semester II

Title of the paper: Practical Lab II

Credit: 02, Practical: 60 Periods, Marks: 50

	Course Objectives:
●	To know the steps involved in organic compound identification
●	To understand the type of organic compound
●	To know about chromatography
●	To understand the estimation process
	List of Experiments
Sr. No.	**Name of the Practical**
	Organic Chemistry Organic Qualitative Analysis.
1.	Identification of at least four organic compounds with reactions including at least one from acids, phenols, bases and neutrals from the list of the compounds given below- • Acids : Oxalic acid, Benzoic acid and Cinnamic acid • Phenols : β - Naphthol, Resorcinol. • Bases : Aniline, p - Toluidine. • 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) ConfirmatoryTest 7) Summary **8)** Result
	Organic Preparation: (Any one)
1.	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.)
	Analytical Chemistry • 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 glycoland n-propyl alcohol] • Determination of refractive index and specific refraction of given liquids. [Any two liquids from,CCl_4, $CHCl_3$, benzene, xylene, toluene, ethyl alcohol]

1.	**Estimations:(any one)** i) Estimation of aniline ii) Estimation of acetamide iii) Estimation of Aspirin **Qualitative Analysis:** • 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+}. • Chromatography: Separation and identification of cations by Paper Chromatographic technique from the following mixtures : • Ni^{2+}+Cu^{2+} • Ni^{2+}+Co^{2+} • Cu^{2+} +Co^{2+}
	Any relevant practical's can be taken
	Reference Books:
	Experiments in Chemistry: D.V. Jahagirdar
	Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
	Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar
	Handbook of Organic Qualitative Analysis: Clarke
	Comprehensive Practical Organic Chemistry- Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient LongmanLtd.,
	Comprehensive Practical Organic Chemistry preparation and Quantitative Analysis.:V.K. Ahluwalia, Renu Agarwal,University Press. Distributor-OrientLongmanLtd.,
	A laboratory Hand-Book of organic Qualitative Analysis and separation: V. S. Kulkarni, Dastane Ramchandra and Co.Pune.
	DSC1-1 Algebra and Calculus (Major) Credit-2 (Contact Hours-30) **Unit I (A)**: Matrices and Linear Equations: Elementary transformations, Rank of a Matrix (Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. Application of matrices to a system of linear (both Homogeneous and Non-homogeneous) equations, Eigen values and Eigen vectors. [8] **Unit I (B)**: Complex numbers: Modulus and Argument of a Complex Number, De Moivre's Theorem and its applications, Roots of Unity, Roots of Complex Numbers [7] Unit.

	II (A): Differentiation: Successive differentiation, nth derivatives of some standard functions, Leibnitz's Theorem, Taylor's theorem and Maclaurin's Theorem (Statements only), Series expansions of ex, sin$x$,cos$x$,(1+x)n log(1+x). [8] **Unit. II (B):** Function of two variables and Vector Calculus: Limit and Continuity of function of two variables, Partial derivatives, Partial derivative of higher orders, Homogeneous functions, Euler's Theorem on Homogeneous functions and its corollaries. Scalar point function, Vector point function, Gradient, Directional derivatives, Divergence, Curl and its properties. **DSC2-1 Practical-I: Mathematics (Major)** **Credits-2.0 (Contact Hours- 60)** **Assignment No. 1. Rank of Matrix.(Row echelon and Normal form)** **Assignment No. 2. Inverse of Matrix by Cayley-Hamilton Method.** **Assignment No. 3. Solution of system of Linear Homogenous and Non-homogenous equation** **Assignment No. 4. Eigen values and Eigen vectors.** **Assignment No. 5. nth roots of a complex number.** **Assignment No. 6 Applications of Leibnitz's Theorem. Assignment No. 7. Partial Differentiation Assignment No.** **8. Examples on Euler's Theorem on Homogeneous functions Assignment No.** **9. Numerical examples on directional derivative, gradient.** **Assignment No.10. Numerical examples on divergence, curl.**

Semester II

DSC 3-2

Title of the paper: Introduction to Fine Chemicals

Credit: 02, Theory: 30 Periods, Marks: 50

	Course Objectives:
•	To Introduce to fine Chemicals.
•	To inculcate the detailed basics preparation of fine Chemicals
•	To study the different types manufacturing steps
•	To understand the application of chemicals in pharmaceutical and Chemical Industries.
Unit 1	**15 hr**
A	**Introduction to Chemical Industry**

1	Explanation of the terms Heavy (Bulk) and Fine (Speciality) Chemicals
B	**Introduction to silicates**:
1	Properties, structure and types of silicates. Preparation of sodium
C	**Manufacture and applications of the following: -**
1	a) Talcum powder b) Nitric acid c) Sodium dichromate d) Chromium trioxide
D	**Industrial solvents: -**
1	Manufacture and uses of ethyl acetate, isopropyl alcohol, Acetone, Acetic acid,
Unit –II	**15 hr**
A	**Perfumes**
1	Introduction, classification (ethers, esters and essential oils) Composition, formation, blending and applications.
2	Synthesis of α and β -ionone's from citral .
B	**Flavours:**
1	Introduction, Classification (natural and synthetic), applications of Vanillin, Coumarin(structures), Synthesis of Vanillin.
C	**Sweeteners:**
1	Introduction, classification with examples and structures of :-
2	**Natural sweetners:** Carbohydrates (Glucose, Fructose)
3	**Synthetic sweeteners:** i) Sucralose, i) Sulphonamide: e.g Saccharin, iii) Peptides: Aspartame, Synthesis of Saccharin
	Learning Outcomes:
•	Realize a manufacturing of chemicals.
•	Comprehend the process, flow diagram and various parameters.
•	Understand and identify problems arising during production
•	Understand difference between solvent and fine chemicals
	Reference books:
1.	C. D. Dryden: Outlines of Chemical Technology, edited & revised by M. Gopala Rao & Marshall Sittig East West Press, New Delhi.
2.	Faith Keyes and Clerk's Industrial Chemicals, 4 Edn., Wiley Inter-science 1975.
3.	Foust A. S. et-al.: Principles of Unit Operations John Wiley & Sons.
4	Macabe W.L., Smith J. C. and Harriott. P. Unit Operations of Chemical Engineering (7th edition) (McGraw Hill Chemical Engineering series).
5	P. H. Groggins: Unit Processes in Organic Synthesis, McGraw Hill.

6	Kirk & Othmer: Encyclopeadia of Chemical Technology, John Wiley and sons.
7	A. I. Vogel: Text book of Quantitative Analysis including Instrumental Analysis.
8	A. I. Vogel: Text book of Quantitative Organic Analysis.
9	Industrial Inorganic Chemistry-Buchner, Schliebs, Winter, translated by D. H. Tenell, VCH Publishers, New York
10	C. D. Dryden: Outlines of Chemical Technology, edited & revised by M. Gopala Rao & Marshall Sittig East West Press, New Delhi.

	Course Objectives:
●	To know the steps involved in organic compound identification
●	To understand the type of organic compound
●	To know about chromatography
●	To understand the estimation process
	Semester II **Title of the paper: Practical Lab II** **Credit: 02, Practical: 60 Periods, Marks: 50**
	List of Experiments
Sr. No.	**Preparations**: (Micro scale)
1	Preparation of Ferrous sulphate heptahydrate
2.	Preparation of Aspirin
3	Green synthesis of benzillic acid from benzil.
	Estimations
1.	Estimation of tincture iodine.
2	Estimation of methyl salicylate. (Back titration method)
3	Estimation of acetic acid in a sample of vinegar (Titrimetry)
4	Any relevant practicals can be taken
	Reference Books:
	Experiments in Chemistry: D.V. Jahagirdar
	Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
	Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar
	Handbook of Organic Qualitative Analysis: Clarke
	Course Objectives:

Semester II (OE-I/GE-I) Title of the paper: Computer for Chemist Credit: 02, Theory: 30 Periods, Marks: 50	
●	Grasp the principles of structured programming through the utilization of C.
●	Introduce students to the basic principles of programming and familiarize students with the syntax and semantics of the C language
●	Gain a comprehensive understanding of Internet technology.
●	Master the Hypertext Markup Language (HTML) for creating the structure and content of web pages, including semantic markup, forms, and multimedia integration.
Unit I	**Basic of C:** **15 hr**
1	History, Features of C, Structure of 'C' programming, C Tokens, Data types, Operators, Control Statements Conditional control statements, Looping, Unconditional control statements
2	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, operation on string, inbuilt String handling functions, arithmetic operation on string, table of string.
Unit II:	**Introduction to HTML, HTML5 and CSS 15 hr**
1	**Introduction:** -Brief History of Internet, what is World Wide Web, URL, Domain, Internet Browser, What is Web Page and a Website, How the Website Works? Types of Websites (Static and Dynamic Websites)
2	**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
3	**HTML5:** Introduction to HTML5, Need of HTML5, DOCTYPE Element, Tags-Section, Article, aside, header, footer, nav, dialog, figure etc., Input tag (Type, Auto focus, placeholder, required etc. attributes.) in HTML5, Graphics in HTML5, Media tags in HTML5, Events in HTML5

	Course Outcomes:
•	Attain a thorough comprehension of office automation concepts, encompassing their significance, advantages, and contemporary workplace applications. tools.
•	Cultivate expertise in utilizing prevalent office productivity software suites like Microsoft Office, Google Workspace, or analogous
•	Develop a comprehensive understanding of Internet technology and its underlying principles.
•	Demonstrate mastery of Hypertext Markup Language (HTML) for structuring and presenting content on web pages, incorporating semantic markup, forms, and multimedia elements
	Reference books:
1.	Let Us C - BPB Publications-by Yashavant Kanetkar
2.	C Programming Language- Pearson- Dennis Ritchie
3.	Programming in C- Oxford University Press-by Ghosh Manas and Dey
4.	HTML 5 Black Book: Covers CSS3, Javasvript, XML, XHTML, AJAX, PHP and jQuery-Dreamtech Press-by Kogent Learning Solutions Inc.
5.	Beginning JavaScript and CSS Development with JQuery-Wrox Press-by Richard York

Semester II Skill Enhancement Course (SEC 2) Chemistry Computer Skill Enhancement Course- Credit: 02, Practical's: 60 Hours Marks: 50	
	Learning Objectives:
•	Gain a comprehensive understanding of office automation concepts, including its significance, benefits, and applications in modern workplaces.
●	Develop proficiency in using popular office productivity software suites such as Microsoft Office, Google Workspace, or other similar tools
●	Develop a comprehensive understanding of Internet technology and its underlying principles
●	Demonstrate mastery of Hypertext Markup Language (HTML) for structuring and presenting content on web pages, incorporating semantic markup, forms, and multimedia elements.

	List of Experiments
Sr. No.	**Name of the Practical (Any Eight practical's)**
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	Develop a simple shell program that can execute basic commands entered by the user.
8	Write a C program for implementation of Priority scheduling algorithms problem
10	Write a C program for implementation of Round Robin scheduling algorithms
11	Write a C program for implementation of FCFS scheduling algorithms. Write a C program for implementation of SJF scheduling algorithms.
12	Write a C program to simulate the concept of Dining-Philosophers
	Course Outcomes • Attain a thorough comprehension of office automation concepts, encompassing their significance, advantages, and contemporary workplace applications

	• Cultivate expertise in utilizing prevalent office productivity software suites like Microsoft Office, Google Workspace, or analogous tools. • Acquire strategies and methodologies for optimizing document creation, organization, storage, retrieval, and dissemination through office automation solutions • Attain a comprehensive understanding of essential operating system concepts, encompassing processes, threads, memory management, file systems, and I/O operations. • Hone programming proficiency by engaging in the creation, management, and synchronization of processes and threads within a multitasking environment
	Reference Books:
1.	Programming in C- Oxford University Press-by Ghosh Manas and Dey
2.	Programming In Ansi C-Tata McGraw Hill -By Balagurusamy
3.	HTML & CSS: The Complete Reference-McGraw-Hill Digital-Fifth Edition-By Thomas Powell
4.	C Programming Language- Pearson- Dennis Ritchie

Semester II

(CC2)

Title of the paper: CC2

Credit: 02, Theory: 30 Periods, Marks: 50

NCC/NSS/Sports/Cultural/MOOCS/SWAYAM/YOGA/Health and Wellness

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UA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B.Sc, B. Sc. Chem. Tech, / B.C.A (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 30

Instructions

1) All Questions are compulsory

2) Figure to right indicate full marks.

Q.1 Choose correct alternative. (MCQ) 06 Marks

1)

a) b) c) d)

2)

a) b) c) d)

3)

a) b) c) d)

4)

a) b) c) d)

5)

a) b) c) d)

6)

a) b) c) d)

Q.2. Answer the following. (Any three) 6 (2+2+2)

A)

B)

C)

D)

E)

Q.3. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.4. Answer the following (Any two). 6 (3+3)

A)

B)

C)

Q.5. Answer the following (Any one). **6 Marks**

A)

B)

CA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B.Sc (Chem. Tech), B. Sc. / B.C.A. (Part- I) w.e.f. AY 2024-25

Time: Total Marks: 20

- **Internal Evaluation System for 20 Marks**
  - Choose any two of the following
  - Home Assignment / Unit Test / Tutorial /Seminar

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- **Pattern of Examination:**
  - External Evaluation + Internal Evaluation
  - 30 Marks + 20 Marks = 50 Marks
- **Passing Criteria:**
  - Written Exam – 12 out of 30
  - Continuous Assessment (CA) – 08 out of 20
