

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

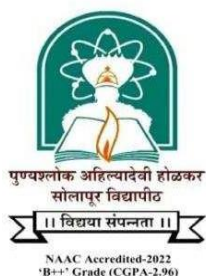
NEP 2020

Syllabus: Chemistry (Paint Technology)

Apprenticeship Embedded Degree Programme (AEDP)

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

(Syllabus to be implemented from June 2026)



**Punyashlok Ahilyadevi Holkar Solapur University,
Solapur**

**Faculty of Science & Technology
NEP 2020 Compliant Curriculum**

**B.Sc. II Chemistry (Paint Technology)
Program Preamble**

The Bachelor of Science (B.Sc.) in Chemistry (Paint Technology) is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of Chemistry (Paint Technology), along with the practical skills required to apply this knowledge in various scientific and technological contexts. Aligned with the vision of the National Education Policy (NEP) 2020, the program offers a flexible, multidisciplinary, and learner-centric curriculum that encourages critical thinking, innovation, and holistic development. The B.Sc. Chemistry (Paint Technology) program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Chemistry (Paint Technology) while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

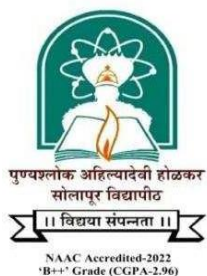
1. **Major Courses:** These core courses form the backbone of the program, providing in-depth knowledge and understanding of essential Chemistry concepts, theories, and methodologies. Students will engage with topics ranging from Chemical Kinetics, Gaseous State, VBT, MOT, Thermodynamics, Name reactions, Coordination Chemistry, Photochemistry, Nuclear Chemistry etc. as well as it provides basic knowledge about Paint and its related terms ensuring a robust and comprehensive education in the discipline.
2. **Minor Courses:** Students have the opportunity to choose minor courses from related or distinct disciplines, promoting an interdisciplinary approach to learning. This flexibility allows students to complement their Chemistry education with insights from fields such as mathematics, Physics or microbiology, zoology, Botany, Geology for enhancing their versatility and broadening their career prospects.
3. **Open Electives/General Electives:** The program encourages intellectual exploration beyond the core discipline by offering a wide range of elective courses. These electives enable students to pursue their interests in diverse subjects, fostering creativity, critical thinking, and a well-rounded educational experience.
4. **Vocational and Skill Enhancement Courses:** Practical skills and technical proficiency are integral to the program, with vocational and skill enhancement courses providing hands-on experience in areas such as Water and soil analysis, Fertilizer and food analysis. These courses are designed to prepare students for immediate employment and equip them with the tools necessary for career advancement in various scientific and technological fields.
5. **Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value Education Courses (VEC):** In alignment with NEP 2020, the program integrates courses that emphasize the Indian Knowledge System, ethical values, and life skills. These courses foster a deep appreciation for India's rich cultural heritage, while also developing essential communication and ethical decision-making skills that are vital for personal and professional growth.
6. **Field Projects/Internships/Apprenticeships/Community Engagement Projects/On-Job Training:** To bridge the gap between theoretical knowledge and real-world applications, the program includes opportunities for field projects, internships, apprenticeships, and community engagement. These experiences provide students with practical insights, problem-solving abilities, and exposure to professional environments, enhancing their readiness for careers in Chemistry (Paint Technology) and related fields.
7. **Research Methodology and Research Projects:** Research is a critical component of the B.Sc. Chemistry (Paint Technology) program, with students acquiring skills in research methodology, data collection, analysis, and scientific inquiry. By engaging in independent research projects, students are encouraged to develop innovative solutions to complex scientific problems, preparing them for advanced studies and research-oriented careers.

Multiple Entry and Multiple Exit Options

In accordance with the NEP 2020, the BSc Chemistry program incorporates a Multiple Entry and Multiple Exit framework, offering students the flexibility to enter or exit the program at various stages. This approach ensures that students can tailor their educational journey according to their personal and professional goals, with options to earn certificates, diplomas, or degrees based on the duration of study completed.

- **Year 1:**
Upon completion of the first year, students may exit with a **Certificate in Chemistry (Paint Technology)**
- **Year 2:**
After two years, students may choose to exit with a **Diploma in Chemistry (Paint Technology)**
- **Year 3:**
Completion of the third year qualifies students for a **B.Sc. Degree in Chemistry (Paint Technology)**
- **Year 4:**
The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an **Honors Degree in Chemistry (Paint Technology)**

- **Eligibility for B.Sc. II Chemistry (Paint Technology):** The candidate passing the B.Sc. Part I course OR having ATKT or Repeater student will be eligible to take admission



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Faculty of Science & Technology
NEP 2020 Compliant Curriculum
B.Sc. Chemistry (Paint Technology)
Program Outcomes (PO)

Students graduating from the Bachelor of Science in Chemistry (Paint Technology)

program will be able to: Major Courses:

- **PO1:** Demonstrate in-depth knowledge and understanding of core concepts, theories, and methodologies in the chosen major discipline.
- **PO2:** Apply disciplinary knowledge to solve complex problems, analyze data, and make informed decisions in professional and research contexts.

Minor Courses:

- **PO3:** Acquire complementary knowledge and skills from a related or distinct discipline, enhancing interdisciplinary understanding and versatility.

Open Electives/General Electives:

- **PO4:** Explore diverse subjects beyond the core discipline, fostering a broad-based education and cultivating critical thinking and creativity.

Vocational and Skill Enhancement Courses:

- **PO5:** Gain hands-on experience and technical proficiency in specific vocational areas, preparing for immediate career opportunities.

Ability Enhancement Courses (AEC), Indian Knowledge System (IKS), and Value**Education Courses (VEC):**

- **PO6:** Understand and appreciate the rich heritage of the Indian Knowledge System, integrating traditional wisdom with modern education.
- **PO7:** Develop ability enhancement skills like communication and life skills along with ethical values, social responsibility, and a strong sense of citizenship, contributing positively to society.

Field Projects/Internship/Apprenticeship/Community Engagement Projects/ On Job Training/ Internship/Apprenticeship:

- **PO8:** Apply theoretical knowledge to real-world situations through field projects, internships, community engagement and On job Training for gaining practical experience and problem-solving skills.

Research Methodology and Research Project:

- **PO9:** Acquire research skills; including data collection, analysis, and interpretation, fostering a scientific approach to problem-solving to develop independent research projects handling capabilities.



**Punyashlok Ahilyadevi Holkar Solapur University,
Solapur**

**Faculty of Science & Technology
NEP 2020 Compliant Curriculum**

**B.Sc. Chemistry (Paint Technology)
Program Specific Outcomes (PSOs)**

**Students graduating from B.Sc. Chemistry (Paint Technology) will
able to:**

**PSO1. Understand basic principles as well as deep Theoretical as well as Practical knowledge of
Organic, Inorganic and Analytical Chemistry.**

PSO2. To understands the Fundamentals of Paints.

PSO3. Understand the Fundamentals of Polymers.

PSO4. Understand the Polymerization techniques etc.

PSO5. To gain deep knowledge about different components and types of paints.

PSO6. To gain deep knowledge about extenders used in paint technology.

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science and Technology

Three Majors in First Year structure as per NEP-2020 Approved in For AC Meeting on 18/04/2024

4- Year Multidisciplinary UG Program with DSC as a Major (4 -Year Bachelor of Science (Honors)/(Honors with Research)

Level/ Difficulty	Sem.	Faculty			Generic/ Open Elective GE/ OE	Vocational and Skill Enhancement Courses (SEC/VSC)	Ability Enhancement Course (AEC), IKS, VEC	Field Project/ RP/CC/Internship/Apprenticeship/ Community Engagement & Services	Credits	Cumulative Credits
		Major		Minor						
		DSC	DSE							
4.5 100-200	I	DSC1-1 (2+2)#	--		GE1/ OE1(2)	SEC1 (2)	L1-1(2) IKS (2) VEC1(2) (Indian Constitution And Democracy)	--	22	44 UG Certificate (44)
		DSC2-1 (2+2)#	--							
		DSC3-1 (2+2)#	--							
	II	DSC1-2 (2+2)#	--		GE2/ OE2(2)	SEC 2 (2)	L1-2(2) VEC2(2) (Environmental Studies)	CC1 (2)	22	
		DSC2-2 (2+2)#	--							
		DSC3-2 (2+2)#	--							
Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major and Minor										
5.0/20 0	III	DSC1-3 (2+1)	---	DSC2-3 (2+1)	GE3 / OE3(2)	VSC1 (2) (DSC1) VSC2(2) (DSC2)	L2-1 (2)	CC2 (2)	22	44 UG Diploma (88)
		DSC1-4 (2+1)	---	DSC2-4 (2+1)						
	IV	DSC1-5 (2+1)	---	DSC2-5 (2+1)	GE4/ OE4 (2)	VSC3 (2) (DSC1) VSC4(2) (DSC2)	L2 -2(2)	FP1/CEP1(2)	22	
		DSC1-6 (2+1)	--	DSC2-6 (2+1)						
Exit option: Award of UG Diploma in Major with 88 credits and an additional 4 credits core NSQF course/ Internship OR Continue with Major										

Structure as per NEP-2020
B. Sc. II (Chemistry)
(Paint Technology)

Level	Sem	Major		Minor		VSC/ SEC	OE/GE	AEC	CC	Total Credits	Cumulative Credits	
		T	P	T	P							
5.0	III	2	1	2	1	OE-1 /GE-1 (2)	VSC1 (2) (DSC1) VSC2 (2) (DSC2)	L2- 1 (2)	CC2-2	22	44	
		2	1	2	1							
	IV	2	1	2	1	OE-2 /GE-2 (2)	VSC 3 (DSC1) VSC4 (DSC2)	L2-2 (2)	FP1/ CEP1	22		
		2	1	2	1							
S.No.	Course Type with course code					Paper Title						Credit
1.	Major DSC1-3					Chemistry-III (Organic Chemistry)						2
2.	Practical based on DSC1-3					Practical Lab – III						1
3.	Major DSC1-4					Chemistry IV (Introduction to paint & polymer technology)						2
4.	Practical based onDSC1-4P					Practical Lab – IV						1
5	Minor DSC2-3					General Chemistry-I (General Analytical Chemistry)						2
6.	Practical based onDSC2-3					General Chemistry Practical Lab – I						1
7	Minor DSC2-4					General Chemistry-II (General Paint Chemistry)						2
8	Practical based onDSC2-4P					General Chemistry Practical Lab – II						1
9	GE-3/OE-3					Chemistry for Competitive Examination-I						2
10	VSC1					VSC based on DSC major						2
11	VSC2					VSC based on DSC minor						2
12	AEC I L2-1											2
13	CC2 (2)					CC2						2
						Total						22
14	Major DSC1 -5					Chemistry-V (Inorganic Chemistry)						2
15	Practical based onDSC1 -5P					Practical Lab - V						1
16	Major DSC1-6					Chemistry –VI (Basic Paint Manufacturing)						2
17	Practical based on DSC1-6P					Practical Lab – VI						1
18	Minor DSC2-5					General Chemistry-III (General Organic Chemistry)						2
19	Practical based onDSC2-5P					General Chemistry Practical Lab – III						1
20	Minor DSC2-6					General Chemistry-IV (Pigments, Solvents and Additives)						2
21	Minor DSC2-6P					General Chemistry Practical Lab – IV						1
22	GE-4/ OE-4					Chemistry for Competitive Examination-II						2
23	VSC3					VSC based on DSC major						2
24	VSC4					VSC based on DSC minor						2
25	AEC II											2
26	FP1/CEP1					FP1/CEP1						2
						Total						22
						Grand Total						44

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

Sr. No.	Course Type with course code	Paper Title	Credit	Marks UA	Marks CA	Total
Semester-III						
1.	Major DSC1-3	Chemistry-III (Organic Chemistry)	2	30	20	50
2.	Practical based on DSC1-3	Practical Lab – III	1	15	10	25
3.	Major DSC1-4	Chemistry IV (Introduction to paint & polymer technology)	2	30	20	50
4.	Practical based on DSC1-4P	Practical Lab – IV	1	15	10	25
5	Minor DSC2-3	General Chemistry-I (General Analytical Chemistry)	2	30	20	50
6.	Practical based on DSC2-3	General Chemistry Practical Lab – I	1	15	10	25
7	Minor DSC2-4	General Chemistry-II (General Paint Chemistry)	2	30	20	50
8	Practical based on DSC2-4P	General Chemistry Practical Lab – II	1	15	10	25
9	GE-3/OE-3	Chemistry for Competitive Examination-I	2	30	20	50
10	VSC1	VSC based on DSC major	2	30	20	50
11	VSC2	VSC based on DSC minor	2	30	20	50
12	AEC I L2-1		2	30	20	50
13	CC2 (2)	CC2	2	30	20	50
		Total	22	330	220	550
Semester-IV						
14	Major DSC1 -5	Chemistry-V (Inorganic Chemistry)	2	30	20	50
15	Practical based on DSC1 -5P	Practical Lab - V	1	15	10	25
16	Major DSC1-6	Chemistry –VI (Basic Paint Manufacturing)	2	30	20	50
17	Practical based on DSC1-6P	Practical Lab – VI	1	15	10	25
18	Minor DSC2-5	General Chemistry-III (General Organic Chemistry)	2	30	20	50
19	Practical based on DSC2-5P	General Chemistry Practical Lab – III	1	15	10	25
20	Minor DSC2-6	General Chemistry-IV (Pigments, Solvents and Additives)	2	30	20	50
21	Minor DSC2-6P	General Chemistry Practical Lab – IV	1	15	10	25
22	GE-4/ OE-4	Chemistry for Competitive Examination-II	2	30	20	50
23	VSC3	VSC based on DSC major	2	30	20	50
24	VSC4	VSC based on DSC minor	2	30	20	50
25	AEC II		2	30	20	50
26	FP1/CEP1	FP1/CEP1	2	30	20	50
		Total	22	330	220	550
		Grand Total	44	660	440	1100

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. (Chemistry) (Paint Technology) Semester-III Vertical: DSC1-3 Course Code: Course Name: Chemistry-III (Organic Chemistry)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: This course is designed as a major. This course consists of two chapters. First unit includes introduction, principle, and applications of UV spectroscopy and stereochemistry covers geometrical as well as conformational isomerism. Second unit comprises nomenclature, structure and reactivity, and chemical reactions of Aldehydes, ketones and carboxylic acids. This course will help students to understand the basics concepts of organic chemistry.

	Course Objectives:
•	To learn about the basic concepts of UV spectroscopy, with its role in structure identification
•	Students should be able to understand the geometrical isomerism in oxime and conformational isomerism
•	To learn R & S as well as E & Z nomenclature system
•	To study aldehyde and ketone including important name reactions of carbonyl compounds
•	To learn different carboxylic acids like monocarboxylic acid, hydroxy acid, unsaturated acid and dicarboxylic acid including their methods of preparation, chemical reactions.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand concept of UV-visible spectroscopy
CO2:	Learn about the possible electronic transitions
CO3:	Learn about instrumentation and calculations of λ_{max}
CO4:	Recognize the geometrical isomers of ketoxime and aldoxime
CO5:	Detect R & S configuration
CO6:	Understand various name reactions associated to aldehyde and ketone
CO7:	Learn about various carboxylic acid in detail
Unit I:	
1	A. Spectroscopic Methods: Ultra-Violet (UV) absorption (08)
1.1	Introduction to Spectroscopy, Beer – Lambert law (mathematical derivation not expected), Types of electronic transitions
1.2	Terms used in UV spectroscopy: Chromophore, Auxochrome, Bathochromic Hypsochromic, Hypochromic and Hyperchromic shifts
1.3	Effect of conjugation on position of UV and visible bands.

1.4	Calculation of max by Woodward-Fieser rules for conjugated dienes and enones.
1.5	Applications of UV spectroscopy – Determination of structure and stereochemistry (cis and trans)
1.6	Spectral problems based on UV. (Spectroscopic charts will not be supplied)
2	B. Stereochemistry (07)
2.1	Geometrical isomerism: Introduction, Geometrical isomerism in aldoximes and ketoximes, configuration of ketoximes-
2.2	Beckmann transformation (Mechanism & Proof are not expected) configuration of aldoximes.
2.3	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.
2.4	Conformational analysis of ethane and n-butane with the help of energy profile diagrams.
2.5	Nomenclature – D & L, R & S, E & Z systems
Unit II:	
3	A. Aldehydes and Ketones (07)
3.1	Introduction, Nomenclature, structure and reactivity of the carbonyl group Mechanism of nucleophilic additions to carbonyl group.
3.2	Study of following reactions with mechanism and applications 1) Aldol condensation (base catalyzed),
3.3	2) Perkin Reaction
3.4	3) Cannizzaro's Reaction
3.5	4) Knoevenagel Reaction
3.6	5) Benzoin Condensation
3.7	6) Grignard Reaction
4	B. Carboxylic acids (08)
4.1	Monocarboxylic acids: Introduction. Methods of formation of Halo acids, di- and trichloro-acetic acid by HVZ reaction, substitution reactions of monochloroacetic acid by nucleophiles -CN, -OH, -I, and -NH ₂ .
4.2	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°K. Uses of citric acid.
4.3	Unsaturated acids: Methods of formation A) Acrylic acid from acrolein and by dehydration of β -hydroxypropionic acid. Reactions of acrylic acid – Addition of H ₂ O, reduction by Na / C ₂ H ₅ OH. 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.
4.4	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 ₂ H ₅ OH 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 soda lime, NH ₃ . Uses of phthalic acid.
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	Advanced Organic Chemistry by, B.S. Bahl, ArunBahl. S.Chand& Company, Ltd.
4	Organic Chemistry by Morrison – Boyd.
5	Spectroscopic methods in Organic Chemistry by Williams and Fleming. Mc
6	Stereochemistry of Organic Compounds by E.L. Eliel. Orient Longman.
7	Stereochemistry of Organic Compounds by P.S. Kalsi. New Age International Ltd.
8	A Guide Book to Mechanism in Organic Chemistry by Peter Sykes.
9	Advanced Organic Chemistry, structure, reactions and mechanism by Jerry March. Mc Graw Hill Kogakusha, Ltd.
10	Spectroscopy of Organic Compounds by P.S. Kalsi.
11	Absorption spectroscopy of Organic molecules by V.M. Parikh.
12	College Organic Chemistry Part I & II by G.R. Chatwal.
13	Stereochemistry by Nasi Puri.
14	Organic synthesis by Smith.



**Punyashlok Ahilyadevi Holkar Solapur University,
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**First Year B.Sc. II (Chemistry)(Paint Technology)
Semester-III**

Vertical: DSC1-3

Course Code:

Course Name: Practical Lab-III (Organic Chemistry)

***Teaching Scheme**

Practical: 02 Hours/week, 01 Credit

***Examination Scheme**

UA: 15 Marks

CA: 10 Marks

Course Preamble: Chemistry practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the qualitative analysis. By applying theoretical knowledge for hands on practical will help students to develop practical skills in analyzing and optimizing the organic chemistry concepts.

	Course Objectives:
•	To develop practical skills in basic and conceptual Organic Chemistry.
•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	Determine the functional groups of molecules by qualitative analysis.
•	Study the volumetric estimation of compound quantitatively
•	Gain the knowledge of preparation of derivatives of organic compounds.
	Course Outcomes: After completion of the course students will be able to
	On successful completion of this practical course student will be able to:
•	Understand practical skills.
•	Correlate theoretical concepts with experiments.
•	Identify organic compounds using qualitative analysis.
•	Quantify the organic compounds using volumetric estimation.
•	Prepare the organic compounds quantitatively
	List of Experiments
Sr. No.	A) Organic Qualitative Analysis: (Any four compounds)
	Identification of at least four organic compounds with reactions including two from acids, two from phenols, one from bases and one from neutrals. Acids: phthalic acid, salicylic acid, Succinic acid Phenols: α – naphthol, p-nitro-phenol, o-nitro-phenol Bases: m-nitro-anilines, N, N-dimethylaniline Neutral: Urea, carbon tetrachloride, ethyl methyl 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.
	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. Singh, I. R. Siddiqui et.al, Pragati Prakashan.



**Punyashlok Ahilyadevi Holkar Solapur University,
Solapur**

Second Year B.Sc.II (Chemistry) (Paint Technology)

Semester-III

Vertical : DSC1-4

Course Code:

Course Name: Chemistry-IV(Introduction To Paint & Polymer Technology)

***Teaching Scheme**

Lectures:02 Hours/week, 02 Credits

***Examination Scheme**

UA:30 Marks

CA: 20 Marks

Course Preamble: This course is designed as a major. This course consists of two chapters. First unit includes basic concepts of paints and oils. The Second unit comprises Fundamentals of polymers, different techniques of polymerization and classification of polymers. This course will help students to understand the basic concepts of Paint Technology.

	Course Objectives:
•	To take review of the Paint Technology.
•	To provide basic knowledge about the Paint and Oil.
•	To discuss the different concepts related to paint and oil.
•	To get an idea about classification and techniques of polymerization.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand definition and formation of paint and oil.
CO2:	Understand the various ingredients required for paint manufacture.
CO3:	Understand the important properties of paint and oil.
CO4:	Understand the terms, Paint, Varnishes, Lacquers, Fatty acids, drying oils, sources and composition of oils etc.
CO5:	Understand the classification of polymers and its techniques of polymerization.
CO6:	Understand classification, extraction and refining of oils.
Unit 1:	BASICS CONCEPTS OF PAINT AND OIL
(A)	GENERAL INTRODUCTION OF PAINT: (08 L) General Introduction of Paint Industry, definition of Paints, Varnishes and Lacquers, their constituents and functions. Basic concepts of paints, general ingredients & their functions.

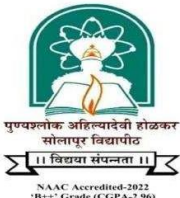
(B)	GENERAL INTRODUCTION OF OILS: (07 L) General introduction to Oils; their sources, composition, physiochemical characteristics. Fatty acids; structures nomenclature, classification and principal sources. Production and consumption pattern of various oils. Introduction of drying oils, sources and composition of oils, non-glyceride, components of oils, classification, extraction and refining of oils.
Unit II:	FUNDAMENTAL OF POLYMERS, CLASSIFICATION AND THIR SYNTHETIC TECHNIQUES (A) FUNDAMENTAL OF POLYMERS: (07 L) Introduction & historical background of polymers, macro-molecular concept, monomers & polymers nomenclature of polymers, features ,characteristics and applications of a polymer, definition of polymerization, rate of polymerization, average degree of polymerization, functionality and polymerization, oligomers and high polymers, scope of elastomeric, fiber forming and plastic materials. (B) CLASSIFICATION OF POLYMERIZATION AND TECHNIQUES OF POLYMERIZATION: (08 L) Types of polymerization, addition (chain) polymerization, condensation polymerization, Comparison between addition and condensation polymerization. Bulk, suspension, solution & emulsion polymerization.
	Reference Books:
1.	Organic Coating Technology vol-2 By Henry Fleming, Payne Publisher John Wiley & Sons
2.	Surface Coatings : Raw materials & their usage Volume-1 By OCCA-Australia Publisher Champas& Hall
3.	Outlines of Paint Technology By WMM organs Publisher Edward Arnold.
4.	PigmentHandbookvol-1ByT.C.Patton
5.	Surface Coatings: Science & Technology By Swaraj Paul Publisher John wiley & Sons.
6.	Polymer Science By V.R. Gowariker Publisher New Age International
7.	Introduction To Paint Chemistry By G.P.A. Turner Publisher champan &Hall
8.	Basics of Paint Technology, Part I & II, by V.C. Malshe & Meenal Sikchi
9.	Outlines of Paint Technology, III Ed. By W.M. Morgans,
10.	Surface coatings: Science and Technology, by Swaraj Paul, John Wiley and Son
11.	Organic Coatings: Science and Technology, Volume I, by Z.W. Wicks, F.N. Jones and S.P. Pappas, Wiley-Interscience

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc.II(Chemistry) Paint Technology Semester-III Vertical : DSC1-4P Course Code: Course Name: Chemistry-Practical Lab-IV (Introduction To Paint & Polymer Technology)	
*Teaching Scheme Lectures:02 Hours/week, 01Credit	*Examination Scheme UA: 15 Marks CA: 10 Marks	

Course Preamble: Paint Technology practical is one of the core courses in the Chemistry curriculum. This course provides an in-depth understanding of the analysis of various components of paints and analysis of various properties of oils. By applying theoretical knowledge for hands on practical will help students to develop practical skills in analyzing and optimizing the paint technology related concepts.

	Course Objectives:
•	To acquire the practical skills
•	To Review the paint analysis.
•	To get knowledge about different techniques of analysis.
•	To acquire the process involved in paint and oil analysis
	Course Outcomes: After completion of the course students will be able to,
CO1:	Understand the practical skills of analysis.
CO2:	Know methods and various types techniques of determination of oil factors.
CO3:	Understand the different properties of paints and oils.
CO4:	Understand various steps involved in gravimetric analysis.
	Testing (Any three)
1.	Preparation of Acrylic Emulsions.
2.	Preparation of Polystyrene by bulk polymerization.
3.	Preparation of Polyacrylate by solution polymerization
4.	To synthesize phenolic resin and test the solubility and softening point.
	Reference Books:

1.	Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.
2.	Organic Coating Technology, Volume I; by Henry Fleming Payne, John Wiley & Sons. 2. Surface Coatings, Volume I; by OCCA Australia (Prepd.), Chapman and Hall
3.	Basics of Paint Technology, Part I & II, by V.C. Malshenht & MeenalSikchi.
4.	Modern Surface Coatings, by P. Nylen and E. Sunderland.
5.	Outlines of Paint Technology, III Ed.; by W.M. Morgans, Edward Arnold
6.	Organic Coatings: Science and Technology, Volume I; by Z.W. Wicks, F.N. Jones and S.P. Pappas, Wiley Interscience
7.	Handbook of coatings additives, by L.J. Calbo (Ed.), Marcel Dekker Inc.
8.	Protective and decorative coatings; by J.J. Mattiello.
9.	Technology of Paints, Varnishes and Lacquers by C.R. Martin.
10.	Basics of Paint Technology, Part I & II, by V.C. Malshenht & Meenal Sikchi.
11.	Vogel's Quantitative Analysis

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II(Chemistry) Semester-III Vertical : DSC2-4 Course Code: Course Name: General Chemistry-II (General Analytical Chemistry)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA: 30 Marks CA: 20 Marks

Course Preamble: General analytical Chemistry is a minor course provided to the students. This course includes the chapters like fundamental analytical chemistry, Physical properties of liquids, chromatography, metallurgy and analysis of food products. This course will help students to enhance the analytical skills.

	Course Objectives:
•	To enhance analytical skills
•	To know basic principles of titrimetric analysis
•	To know about the chromatography
•	To understand the metallurgy

	Course Outcomes: After completion of the course students will be able to
CO1:	Prepare the solutions in different units
CO2:	Understand the fundamental physical properties
CO3:	Know the general principle of Chromatography
CO4:	Understand the basics of metallurgy and metallurgical processes
CO5:	Know nutritional values of food
CO6:	Identify the different adulterations in the food
Unit I:	
1	Fundamentals of Analytical Chemistry 05
1.1	Basic principle of titrimetric analysis and classification
1.2	Concept of primary and secondary standard, Preparation and dilution of reagents/solutions
1.3	Normality, Molarity, molality and Mole fraction, weight fraction, % composition by weight and by volume. Use of $N_1 V_1 = N_2 V_2$ formula
1.4	Preparation of ppm level solutions from source materials (salts), conversion factors, density and specific gravity of solutions
1.5	Problems are expected.
2	Physical Properties of Liquids 05
2.1	Introduction
2.2	Parachor: Macleod equation and its modification by Sugden, Applications of parachor in the determination of molecular structures of benzene and -NO ₂ group
2.3	Dipole moment, polar and non-polar molecules, electrical polarizations of molecules, use of dipole moment in the study of molecular structures
3.	Chromatography 05
3.1	Introduction and General principle of Chromatography
3.2	Classification of Chromatography based on nature of stationary and mobile phase.
3.3	Paper Chromatography: Principle, Experimental procedure and applications
Unit II	
4	Metallurgy 10
4.1	Introduction, Definitions: Metallurgy, Mineral, Ore, Gangue, Flux, and 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 of Aluminium C. Refining: i) Methods of Refining ii) Electrolytic refining of copper	
5	Analysis of food products	05
5.1	Nutritional values of foods, idea about food processing and food preservation and adulteration	
5.2	Identification of adulteration in some common food items like milk, coffee powder, chilli powder, turmeric powder, coriander powder, pulses.	
	Reference Books	
1	Industrial Chemistry by B.K. Sharma.	
2	Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford	
3	Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.	
4	Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.	
5	Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.	
6	Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).	
7	Environmental pollution analysis - S.M. Khopkar	
8	Environmental Chemistry - A.K. De	
9	Day, R. A. & Underwood, A. L. Quantitative Analysis, Prentice Hall of India	
10	Dean, J. A. Analytical Chemistry Notebook, McGraw Hill.	
11	G D Christian - Analytical Chemistry	
12	Vogel's Quantitative Analysis	

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्याया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II (Chemistry) Semester-III Vertical :DSC-2-4P Course Code: Course Name: Chemistry-Practical Lab-I (Analytical Chemistry)	
*Teaching Scheme Lectures:02 Hours/week, 01 Credits	*Examination Scheme UA: 15 Marks CA: 10 Marks	

Course Preamble: This is minor course designed for the students to improve the analytical practical skills. It also provides opportunity to the students for laboratory work to inculcate the experiential learning.

	Course Objectives:
•	To develop practical skills in basic and conceptual Organic Chemistry.
•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To Gain the knowledge of preparation of derivatives of organic compounds.
•	To explore separation process of metal form the alloy.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand practical skills.
CO2:	Correlate theoretical concepts with experiments.
CO3:	Prepare the organic compounds quantitatively
CO4:	Understand the type of reaction involved in the preparation.
CO5:	Acquire skills in determination of viscosity of the given liquids
CO6:	Acquire skills in determination of refractive indices of the given liquids
	Organic Chemistry
	Preparations of derivatives of organic compounds (Any Three) i) Nitration of aromatic nitro hydrocarbon ii) Oximes of aldehydes & ketones iii) Picrate Aromatic hydrocarbon iv) Oxalate of amide v) Nitrate of amide
	Inorganic Chemistry
	Semi-micro Qualitative Analysis : (Any Three)
	Cations : Co^{++} , Al^{+++} , Fe^{+++} , Mn^{++}
	Anions : Cl^- , Br^- , I^- , SO_4^{2-} , NO_3^- , CO_3^{2-}
	Physical Chemistry(Any Three)
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 given liquid (benzene, toluene and xylene) by Abbe's refractometer
3	Refractometry: To determine the refractive of series of solutions of salt and determine the concentration of salt in a given solution
4	Surface Tension: To determine the surface tension of methyl acetate, ethyl acetate, n-hexane and chloroform and hence to calculate atomic parachors of C, H, Cl.
	Reference Books

1.	Advanced Inorganic Analysis by Agrawal and KeemtiLalPragatiPrakashan
2.	Practical Inorganic Chemistry by Shikha Gulati, JL Sharma, ShagunManocha CBS Publishers and Distributors Pvt Ltd
3.	Practical Inorganic Chemistry by Samir Kumar Maji, Books & Allied (P) Ltd.
4.	Practical Organic Chemistry by A.I. Vogel.
5.	Hand book of Organic qualitative analysis by H.T. Clarke.
6.	A laboratory Hand Book of Organic qualitative analysis and separation by V.S. Kulkarni. Dastane Ramchandra & Co.
7.	Experiments in General Chemistry by C.N.R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.
8.	Experimental Physical Chemistry by Rajbhoj and Chondhekar, Anjali Pub.
9.	Advanced Experimental Chemistry Vol. I Physical by J.N. Gurtu and R. Kapoor S. Chand & Co.
10.	Experiments in Physical Chemistry by R.C. Das & B. Behra. Tata McGraw Hill.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संयन्त्रता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II (Chemistry) Semester-III Vertical : DSC2-4 Course Code: Course Name: General Chemistry-II (General Paint Chemistry)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA: 30 Marks CA: 20 Marks

Course Preamble: General Chemistry is a minor course provided to the students. This course includes the chapters like Pigments and Extenders. Various types of like organic, inorganic, miscellaneous pigments and extenders are also discussed in this paper. This course will help students to enhance the detailed knowledge about extenders and pigments.

	Course Objectives:
●	Understand the color phenomena.
●	Understand the Difference B/W Pigments & Dyes.
●	Understand the Extenders and Pigments and their manufacturing Processes.
	Course Outcomes: After completion of the course students will be able to
CO1:	To gain the detailed knowledge about extenders.

CO2:	To understand the different types of pigments.
CO3:	To gain the detailed knowledge about extenders.
CO4:	Understand the basics of pigments.
CO5:	Understand the Extenders and Pigments, and their manufacturing Processes.
CO6:	Learn about Inorganic and organic & Special effect Pigments.
CO7:	Understand the Extenders and Pigments, and their manufacturing Processes.
Unit I:	PIGMENTS:
(A)	INTRODUCTION: (07 L) Concept of color phenomena, classification of pigments, testing of pigments. Oil absorption value, bulking value, sp. Gravity, refractive index, mass tone, reducing power, tinting strength, resistance to heat. Definition of pigment Dyes, dyes stuffs, toners and lake pigment etc.
(B)	ORGANIC PIGMENTS: (08 L) Natural organic pigments, comparison of organic pigments and inorganic pigments General method of preparation and classification of synthetic organic pigment. Basic and acid dye pigment.
Unit II (A)	INORGANIC PIGMENTS: (08 L) (I)-White pigment such as titanium di-oxides, zinc-oxide, Zinc Sulphate, Lithopone etc. (II)- Color pigments natural and synthetic iron oxide, lead chromate , silico-chromates and molybdates, chrome green, chromium oxide, cadmium pigments, Prussian and ultramarine blue, black, mercuric sulphide, synthetic inorganic complexes etc. (III)- Metallic pigments such as aluminium, Zinc, copper alloys, stainless steel etc., anticorrosive pigments such red lead, silicon chromate, zinc and strontium chromate white molybdates, calcium plumbate etc. Functional and miscellaneous pigments such as cuprous and mercuric oxides, barium meta borate, nacreous luminescent, etc.
(B)	MISCELLANEOUS PIGMENTS: (07 L) Phthalocyanine blue and green, honsa yellows rubine, toners, para reds, toludine, metallic, phosphorocent, flourescent pearl pigments, treated pigments. Testing and identification of organic pigments.
	Reference Books:

1.	Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.
2.	Organic Coating Technology, Volume I; by Henry Fleming Payne, John Wiley & Sons. 2. Surface Coatings, Volume I; by OCCA Australia (Prepd.), Chapman and Hall
3.	Basics of Paint Technology, Part I & II, by V.C. Malshenht&MeenalSikchi.
4.	Modern Surface Coatings, by P. Nylen and E. Sunderland.
5.	Outlines of Paint Technology, III Ed.; by W.M.Morgans, Edward Arnold
6.	Organic Coatings: Science and Technology, Volume I; by Z.W.Wicks, F.N. Jones and S.P. Pappas, WileyInterscience
7.	Handbook of coatings additives, by L.J. Calbo (Ed.), Marcel Dekker Inc.
8.	Protective and decorative coatings; by J.J. Mattiello.
9.	Technology of Paints, Varnishes and Lacquers by C.R. Martin.
10.	Basics of Paint Technology, Part I & II, by V.C.Malshenht&MeenalSikchi.
11.	The Chemistry and Physics of Organic Pigments by L.S.Pratt.
12.	Pigment Hand book Vol. I, II and III by T.C.Patton.
13.	Basics of Paint Technology, Part I & II, by V.C.Malshe&MeenalSikchi
14.	Pigments, dyestuffs and lakes, part six, Paint Technology Manuals.
15.	Organic Coating Technology Vol. I & II by H.F.Payne.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्याया संयन्त्रता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II (Chemistry) Semester-III Vertical :DSC-2-4P Course Code: Course Name: Chemistry-Practical Lab-I (General Paint Chemistry)	
*Teaching Scheme Lectures:02 Hours/week, 01 Credits		*Examination Scheme UA: 15 Marks CA: 10 Marks

Course Preamble: This is minor course designed for the students to improve the analytical practical skills. It also provides opportunity to the students for laboratory work to inculcate the experiential learning.

	Course Objectives:
●	To develop practical skills in basic and conceptual paint Chemistry.

•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To understand the concept of specific gravity Moisture content, viscosity etc.
•	To Gain the knowledge of Pigment.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand practical skills.
CO2:	Correlate theoretical concepts with experiments.
CO3:	To understand the concept of specific gravity.
CO4:	Understand the type of reaction involved in the preparation.
CO5:	Acquire skills in determination of viscosity of the given liquids
CO6:	Acquire skills in determination of moisture content of the given sample.
	Pigments :
1.	Testing of pigments such as oil absorption value, bulk-ins value, tinting strength, reducing power, mass tone etc.
2.	To check the form and condition of pigment.
3.	To determine the moisture content of pigment.
4.	To determine the viscosity of paint/primer by FORD cupno04.
5.	To check the flash and fir point of solvent.
	Reference Books
1.	The Chemistry and Physics of Organic Pigments by L.S.Pratt.
2.	Pigment Hand book Vol. I, II and III by T.C.Patton.
3.	Basics of Paint Technology, Part I & II, by V.C.Malshe&MeenalSikchi
4.	Pigments, dyestuffs and lakes, part six, Paint Technology Manuals.
5.	Organic Coating Technology Vol. I & II by H.F.Payne.
6.	Organic Coatings: Science and Technology, Volume I; by Z.W. Wicks, F.N.Jones and S.P. Pappas, Wiley Interscience
7.	Handbook of coatings additives, by L.J. Calbo (Ed.), Marcel Dekker Inc.
8.	Protective and decorative coatings; by J.J. Mattiello.
9.	Technology of Paints, Varnishes and Lacquers by C.R. Martin.
10.	Basics of Paint Technology, Part I & II, by V.C. Malshenht & Meenal Sikchi.
11.	Vogel's Quantitative Analysis.



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Second Year B.Sc. II (Chemistry) Semester-III

Vertical : GE/OE 3

Course Code:

Course Name: Chemistry-GE/OE-3 (Chemistry for
Competitive Examination-I)

*Teaching Scheme

Lectures:02 Hours/week, 02 Credits

*Examination Scheme

UA:30 Marks

CA: 20 Marks

Course Preamble: Chemistry-GE/OE-3 is one of the courses in the Chemistry curriculum. This course provides basic knowledge of chemistry required for competitive examination. This course consists of four chapters which covers the topics like Structure of atom, Concept of matter and chemical classification of matter, Chemical bonding and Carbon Compounds.

	Course Objectives:
•	To know basic structure of atom
•	To understand various atomic models
•	To know about quantum numbers
•	To understand the chemical bonding
	Course Outcomes: After completion of this course, the students are able to
CO1:	Understand the atomic models
CO2:	Know different quantum numbers
CO3:	Understand types of chemical bonding
CO4:	Understand the IUPAC nomenclature
CO5:	Understand the chemical reactions of carbon compounds
Unit I	
1	Structure of atom: 8L
1.1	Introduction, Dalton's atomic model, Thomson's atomic model, Rutherford nuclear model of atom, Bohr's stable orbit atomic model
1.2	Structure of atom: Proton, neutron and electron, Distribution of electron
1.3	Electronic configuration of element: Valency, Aufbau principle and Pauli's exclusion principle.
1.4	Atomic number, Atomic mass, Isotopes, Isobar, Isotone
1.5	Quantum numbers.
2	Concept of matter and chemical classification of matter:7L
2.1	Introduction, State of matter, Characteristics of solid, liquid and gas, Critical temperature, pressure and volume, Change of state of matter,
2.2	Chemical classification of matter: Element, Compound, Mixture, Types of element, compound and mixture.
2.3	Types of solution, Concentration of Solution: Percentage by weight, Percentage by volume Mole fraction, ppm, Molarity, Normality and Molality.
Unit II	

3	Chemical bonding: 7L
3.1	Introduction, Valency, Octet Rule,
3.2	Types of bonding: Ionic bond and Covalent bond,
3.3	Types of covalent bond: sigma and pi bond, Polarity of covalent bond, Dipole moment,
3.4	Co-ordinate bond, Metallic bond, van der Waals force, Hydrogen bond
4	Carbon Compounds: 8L
4.1	Carbon, Allotropes of carbon, non-crystalline/amorphous forms of carbon, Carbon monoxide and carbon dioxide,
4.2	Hydrocarbons: basic organic compounds, Methane
4.3	Bonds in carbon compound, Catenation, Isomerism, Classification of hydrocarbon
4.4	Functional groups in carbon compounds, IUPC nomenclature
4.5	Chemical reactions of carbon compounds.
	Reference Books:
1	General Chemistry- C. N. R. Rao
2	Organic Chemistry - Pine
3	Essentials of Physical Chemistry- Puri, Sharma and Pathania
4	Inorganic Chemistry- Puri, Sharma and Pathania
5	Essentials of Physical Chemistry- Bahl and Tuli
6	Advanced Physical Chemistry- Gurudeep Raj
7	General Science- Bhaske, Bhaske Publication
8	Science- All in One- Dr. Monali Salunkhe, DeepstambhPrakashan

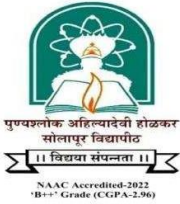
 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II(Chemistry) Semester-III Vertical :VSC1 Course Code: Course Name: Chemistry-Practical Lab-III and IV (Organic Chemistry + Paint Technology: Paint and Oil)
*Teaching Scheme Lectures:04 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: Organic Chemistry and Paint Technology practicals are one of the core courses in the Chemistry program. This course offers a comprehensive understanding of the practical concepts in Organic chemistry and Paint Technology. The students will get hands-on training on preparation of organic Chemistry and Paint Technology compounds.

	Course Objectives:
•	To develop practical skills in basic and conceptual Organic Chemistry.

•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To Review the paint analysis.
•	To get knowledge about different techniques of analysis.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand practical skills.
CO2:	Correlate theoretical concepts with experiments.
CO3:	Prepare the organic compounds quantitatively
CO4:	Know methods and various types techniques of determination of oil factors.
CO5:	Understand the different properties of paints and oils.
	Organic Chemistry
	Organic Quantitative Analysis: Organic Preparations 1. Preparation of phthalimide from phthalic anhydride. 2. Preparation of p-bromo acetanilide 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-nitro ethyl benzoate from p-nitrobenzoic acid
	Paint Technology:
1.	To synthesize alkyd resins and test acid value and drying value
2.	To synthesize urea formaldehyde resin and test the solubility.
3.	To prepare medium oil alkyd resin and test the acid value
5	To prepare oil and resins varnish.
	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	Organic Coatings: Science and Technology, Volume I; by Z.W. Wicks, F.N. Jones and S.P. Pappas, Wiley Interscience
7	Handbook of coatings additives, by L.J. Calbo (Ed.), Marcel Dekker Inc.
8	Protective and decorative coatings; by J.J. Mattiello.

9	Technology of Paints, Varnishes and Lacquers by C.R. Martin.
10	Basics of Paint Technology, Part I & II, by V.C. Malshenht & MeenalSikchi

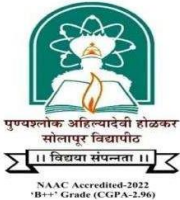
 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 B++ Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. (Chemistry) (Paint Technology) Semester-III Vertical: VSC2-P Course Code: Course Name: Chemistry-Practical Lab-I and II (General Analytical Chemistry + Paint Chemistry: Pigment)
*Teaching Scheme Lectures: 02 Hours/week, 02 Credits	*Examination Scheme UA: 30 Marks CA: 20 Marks

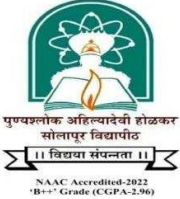
Course Preamble: This is minor course designed for the students to improve the analytical practical skills. It also provides opportunity to the students for laboratory work to inculcate the experiential learning.

	Course Objectives:
•	To develop practical skills in basic and conceptual Analytical Chemistry.
•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	To understand the concept of specific gravity Moisture content, viscosity etc.
•	To Gain the knowledge of Pigment.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand practical skills.
CO2:	Correlate theoretical concepts with experiments.
CO3:	Understand the concept of specific gravity Moisture content, viscosity etc.

CO4:	Gain the knowledge of Pigment.
CO5:	Understand the chemistry of Pigments practically.
	Analytical Chemistry (Any Three)
	Volumetric Analysis
1.	Analysis of commercial vinegar – To determine the percentage of acetic acid is a given commercial sample of vinegar.
2.	To prepare standard solution of calcium chloride from calcium carbonate and determine the total hardness of given water sample.
3.	Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.
4.	Fertilizer analysis : To determine the percentage of nitrogen present in a given sample of nitrogenous fertilizer.
5.	Quality control – To determine percentage purity of soda ash in the given sample.
	Paint Chemistry: Pigment (Any Three)
1.	Synthesis and Characterization of Pigments: Preparation of red iron oxide (Fe_2O_3) pigment.
2.	Preparation of Polymer-Based Paint: To prepare a simple paint using a polymer binder and pigment.
3.	Pigment Dispersion Studies:
4.	To study pigment dispersion in different polymer media.
5.	UV Stability and Color Fastness Testing.
6.	Determination of PVC (Pigment Volume Concentration)
	Reference Books
1.	Advanced Inorganic Analysis by Agrawal and Keemti Lal Pragati Prakashan
2.	Practical Inorganic Chemistry by Shikha Gulati, JL Sharma, Shagun Manocha CBS Publishers and Distributors Pvt Ltd
3.	Practical Inorganic Chemistry by Samir Kumar Maji, Books & Allied (P) Ltd.
4.	Practical Organic Chemistry by A.I. Vogel.
5.	Hand book of Organic qualitative analysis by H.T. Clarke.
6.	A laboratory Hand Book of Organic qualitative analysis and separation by V.S. Kulkarni. Dastane Ramchandra & Co.
7.	The Chemistry and Physics of Organic Pigments by L.S.Pratt.
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10.	Pigments, dyestuffs and lakes, part six, Paint Technology Manuals.
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12.	Organic Coating Technology, Volume I; by Henry Fleming Payne, John Wiley & Sons. 2. Surface Coatings, Volume I; by OCCA Australia (Prepd.), Chapman and Hall

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14.	Modern Surface Coatings, by P. Nylen and E. Sunderland.
15.	Outlines of Paint Technology, III Ed.; by W.M. Morgans, Edward Arnold
16.	Organic Coatings: Science and Technology, Volume I; by Z.W. Wicks, F.N.Jones and S.P. Pappas, Wiley Interscience

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. II Chemistry(Paint Technology) Semester-III Vertical : AEC Course Code: ENG-101 Course Name: English for Communication-Paper-I
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year BSc Chemistry (Paint Technology) Semester-III Vertical : CC2 Course Code: Course Name:
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*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Semester IV

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	PunyashlokAhilyadeviHolkar Solapur University, Solapur Second Year B. Sc. Chemistry (Paint Technology) Semester-IV Vertical: DSC1-4 Course Code: Course Name: Chemistry-IV (Inorganic Chemistry)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: This major course consists of two units. Unit-I has one chapter named as coordination chemistry. Unit-II has two chapters namely chelation and study of d-block elements. These chapters mainly focus on the various aspects of coordination chemistry and physicochemical properties of d-block elements.

	Course Objectives:
•	To take review of the Co-ordination Chemistry, Chelation and study of d-block elements.
•	To provide basic knowledge about the co-ordination Chemistry, Chelation and study of d-block elements.
•	To discuss the periodicity in properties with reference to the d block.
•	To get an idea about horizontal similarity in a period in addition to vertical similarity in a group.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand definition and formation of co-ordinate covalent bond.
CO2:	Understand the IUPAC nomenclature of co-ordination compounds
CO3:	Understand the important properties valence bond theory of transition metal complexes.
CO4:	Understand the terms, ligand, denticity of ligands, chelate, coordination number and use standard rules to name coordination compounds.
CO5:	Understand chelate classification and its structure and applications
CO6:	Understand Position of d-block elements in periodic table, and Comparison of 1st transition series with 2nd & 3rd transition series
Unit 1:	
1.	Co-ordination Chemistry (15)
1.1	Definition and formation of co-ordinate covalent bond in $\text{BF}_3 : \text{NH}_3$ and in $[\text{NH}_4]^+$.
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] $\text{CoCl}_3.6\text{NH}_3$ b] $\text{CoCl}_3.5\text{NH}_3$, c] $\text{CoCl}_3.4\text{NH}_3$, d] $\text{CoCl}_3.3\text{NH}_3$ 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 features E. Applications: High spin and low spin complexes w.r.t. CN = 4 and CN = 6. F. Limitations of Valence bond theory.
Unit II:	

2.	Chelation (05)
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.
3.	Study of d-block elements (10)
3.1	Introduction,
3.2	Position of d-block elements in periodic table,
3.3	Names & electronic configuration of 1 st , 2 nd & 3 rd three transition series.
3.4	General Characteristics of 3 d-block elements w.r.t. – a) oxidation state b) colour c) Magnetic behavior (spin only formula) d) catalytic properties and e) tendency to form complexes.
3.5	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
12.	Concise Inorganic Chemistry by J.D. Lee ELBS 4th & 5th Edn.
13.	Basic Inorganic Chemistry by F.A. Cotton, G. Wilkinson and P.L. Gaus Wiley.
14.	Concepts and Models of Inorganic Chemistry by B. Douglas. D.Mc. Daniel and J. Alexander, John Wiley.
15.	Advanced Inorganic Chemistry by Satyaprakash, Tuli, Basu (S. Chand and Co.)
16.	Inorganic Chemistry by Puri and Sharma (S. Chand & Co.)
17.	Inorganic Chemistry by Agrawal.
18.	Inorganic Chemistry by D.E. Shriver, P.W. Atkins and C.H. Longford, Oxford.
19.	Selected topics in Inorganic Chemistry : Madan, Malik Tuli, S. Chand & Company.
20.	Vogel's Text Book of Quantitative Inorganic Analysis–Bassett, Denny, Jeffery Mendham.



**Punyashlok Ahilyadevi Holkar Solapur University,
Solapur**

Second Year BSc Chemistry (Paint Technology)

Semester-III Vertical: DSC1-4P

Course Code:

Course Name: Chemistry-Practical Lab-IV (Inorganic Chemistry)

***Teaching Scheme**

Lectures: 02 Hours/week, 01 Credit

***Examination Scheme**

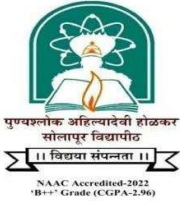
UA: 15 Marks

CA: 10 Marks

Course Preamble: Inorganic Chemistry practical is one of the core courses in the Chemistry program. This course offers a comprehensive understanding of the practical concepts in Inorganic chemistry. Theoretical aspects and practical's correlation that will be beneficial to grow practical skills.

	Course Objectives:
•	To acquire the practical skills
•	To Review the gravimetric analysis
•	To get knowledge about steps in gravimetric analysis
•	To acquire the process involved in gravimetric analysis
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand the practical skills of preparations.
CO2:	Know methods and various combination of chemicals.
CO3:	Understand the different properties of precipitation.
CO4:	Understand various steps involved in gravimetric analysis.
CO5:	Understand precipitation process in gravimetric analysis.
	Gravimetry (Any three)
1.	Gravimetric estimation of Fe as Fe_2O_3 from a solution containing ferrous ammonium sulphate and free sulphuric acid.
2.	Gravimetric estimation of Ba as BaSO_4 from a solution containing barium chloride and free hydrochloric acid.
3.	Gravimetric estimation of Ca as CaO from the given solution containing calcium carbonate and hydrochloric acid.
4.	Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, and free sulphuric acid.

5.	Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate and free sulphuric acid.
	[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm³ and asked to dilute to 100 cm³ (or the stock solution should be given in the range of 20 to 30 cm³ and asked to dilute to 250 cm³). Use 50 cm³ of this diluted solution for estimation.]
	Reference Books
1.	Inorganic Preparations – Alexander King George Allen & Unwind Ltd.
2.	Quantitative Inorganic Chemistry – A.I. Vogel.
3.	Practical Chemistry – Physical – Inorganic – Organic and Vice-voce by Balwant Rai Satija. Allied Publishers Pvt. Ltd.
4.	Basic Concepts in Analytical Chemistry – S.M. Khopkar.
5.	Vogel's Text Book of Quantitative Inorganic Analysis – Bassett, Denny, Jeffery Mendham.

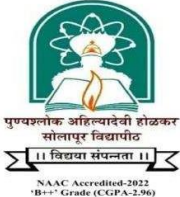
 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B. Sc. Chemistry (Paint Technology) Semester-IV Vertical: DSC1-5 Course Code: Course Name: Chemistry-V (Basic Paint Manufacturing)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: In this Subject there is discussion of Formulation of the Coating for different applications. Various parameters, and steps during formulation is discussed, there is also discussion on the machinery for manufacturing of Coating and safety principles during the Sam

	Course Objectives:
1.	Protecting surfaces from environmental damage: This includes weathering,

	corrosion, and other physical or chemical aggressions.
2.	Providing aesthetic value: This involves creating desired colors, finishes, and textures
3.	Maintaining high product quality: This ensures consistency, durability, and performance.
4.	Optimizing production processes: This includes efficiency, cost-effectiveness, and reducing lead time.
5.	Developing innovative and specialized paints: This involves creating new formulations and technologies.
	Course Outcomes: After completion of the course students will be able to
CO1:	Formulate a Coating for the Given Requirement.
CO2:	Choose the correct machinery for manufacturing.
CO3:	Make the safe environment during manufacturing
Unit 1:	PAINT FORMULATIONS 15 Periods
(A)	GUIDE LINES TO PAINT FORMULATIONS (08) Simple guide lines to paint formulations. Inputs and information to formulation, Rheology, Viscosity and flow properties, Oil absorption, Pigment volume concentration (PVC) and critical Pigment volume concentration (CPVC), Variation in the properties of coatings with change` in PVC.
(B)	DISPERSION EQUIPMENT/MACHINERY. (07) Pigment Dispersion, wetting and grinding, Dispersion and stabilization, Daniel flow point method – importance – mill base formulations. Ball Mill, Pug Mills, Sand Mill, Double and Triple Roll Mills, Attritors, High Speed Dispersers, turbo Mills, Dyno Mills etc.
Unit II	PAINT APPLICATION 15 Periods
(A)	PAINT APPLICATION (07) Application of Decorative and architectural paints. Surface preparation, importance of sanding and area inspection for interior and exterior painting, Pre-treatment of wood, masonry, and cementaceous surfaces
(B)	GUIDELINES FOR APPLICATIONS OF PAINT(08) Importance of putties, water proofing chemicals, crack filling and Plaster of Paris, various application methods with their advantages and limitations, Brushing, roller coating and spraying, Type of brushes and rollers – selection criteria,.

	Reference Books
1	Basics of Paint Technology- Part- 2 By V.C.Maliha, Meenal. A.Sikchi
2	Organic Coating Technology vol-2 By Henry Fleming, Payne Publisher John Wiley & Sons.
3	Surface Coatings : Raw materials & their usage Volume-2 By OCCA-Australia Publisher Champas& Hall
4	Outlines of Paint Technology By W.M.Margans Publisher Edward Arnold.
5	Surface Coatings: Science & Technology By Swaraj Paul Publisher John wiley& Sons.
6	Organic Coatings: Science & Technology By Z.W.WICKS, F.N.JONES, S.P.PAPPAS Publisher Wiley & Sons
7	Paint Formulation : Principles and Practice By J Boxall&J.A.Fraunhofer

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B. Sc. (Chemistry) (Paint Technology) Semester- IV Vertical: DSC1-5 P Course Code: Course Name: Chemistry Practical-V (Basic paint manufacturing)	
*Teaching Scheme Lectures:02 Hours/week, 01 Credits	*Examination Scheme UA:15 Marks CA: 10 Marks	

Course Preamble: A course in basic paint manufacturing aims to equip individuals with the knowledge and skills needed to understand the paint industry, from raw materials to production and application. It covers topics like paint composition, manufacturing processes, quality control, and different types of paints and coatings. The course also highlights the growing demand for paint technologists and the various career opportunities available in the industry.

	Course Objectives:
1.	To Understanding Paint Formulation.
2.	To Paint Manufacturing Process
3.	Troubleshooting and Problem-Solving
	Course Outcomes: After completion of the course students will be able to

CO1:	TO understanding paint ingredients.
CO2:	To formulation of basic paints
CO3:	To mixing techniques.
CO4:	To Paint Application Techniques.
	Basic paint manufacturing Practicals (Any four)
1	Preparation and testing of froin modifications such as ester gum, maleic resins, etc.
2	Preparation and testing of synthetic resins such as alkyds, etc.
3	Preparation & testing of stand oils.
4	Preparation & testing of dehydrated castor oils (DCO).
	Reference Books
1	Basics of Paint Technology- Part- 1 By V.C.Maliha, Meenal. A.Sikchi
2	Organic Coating Technology vol-1 By Henry Fleming, Payne Publisher John Wiley & Sons.
3	Surface Coatings : Raw materials & their usage Volume-1 By OCCA-Australia Publisher Champas & Hall
4	Outlines of Paint Technology By W.M.Margans Publisher Edward Arnold.
5	Introduction To Paint Chemistry By G.P.A.Turner Publisher champan & Hall

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संयन्त्रता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc. (Chemistry) Semester-IV Vertical: DSC2-5 Course Code: Course Name: General Chemistry III (General Organic Chemistry)
*Teaching Scheme Lectures: 02 Hours/week, 02 Credits	*Examination Scheme UA: 30 Marks CA: 20 Marks

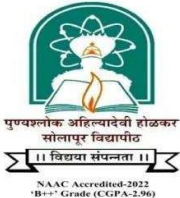
Course Preamble: This course is designed as a minor. This course consists of two chapters. First unit includes basic concepts of alkanes, alkenes and alkynes. Second unit includes aromaticity, alcohols and phenols. This course will help students to understand the basics concepts of organic chemistry.

	Course Objectives:
•	To study saturated, unsaturated and alicyclic hydrocarbons.

•	To study the concept of aromaticity, its applications and reactions.
•	To study the reactions involved in saturated, unsaturated and alicyclic hydrocarbons
•	To study different types of alcohols and phenols.
	Course Outcomes: After completion of the course students will be able to
CO1:	Distinguish between saturated, unsaturated, alicyclic, aromatic and heterocyclic compounds.
CO2:	To comment on aromaticity of any organic compound and its stability.
CO3:	Distinguish between dihydric and trihydric alcohols.
CO4:	Understand the idea of monohydric, dihydric and trihydric phenols.
Unit 1:	(15)
1.	Alkanes and Cycloalkanes: (7)
1.1	Alkanes: Introduction and methods of formation of alkanes with respect to Wurtz reaction, Kolbe reaction, Corey- House reaction and decarboxylation reaction.
1.2	Mechanism of free radical halogenation of alkanes.
1.3	Cycloalkanes: Nomenclature, Methods of formation: a) Internal Wurtz reaction b) Distillation of calcium or barium salt of dicarboxylic acid
1.4	1.4 Chemical properties of cyclopropane a) Free radical substitution of chlorine in presence of light. b) Action of HBr and conc. H ₂ SO ₄ c) Catalytic reduction by H ₂ /Ni
2	Alkenes, Dienes and Alkynes (08)
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 of dienes
2.5.	Classification of dienes: Isolated, Conjugated and Cumulated dienes
2.6	Butadiene: Methods of formation, polymerization, 1:2 and 1:4 additions and Diels-Alder reaction
2.7	Alkynes: Nomenclature, Acidity of alkynes
2.8	Electrophilic and Nucleophilic addition reactions, Hydroboration, Oxidation
Unit-II	(15)
3	Aromaticity and Benzene (07)
3.1	Aromatic, non-aromatic, antiaromatic and pseudo aromatic compounds

3.2	Kekule's 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 $(4n+2)$ π rule. Applications of Huckel's rule to naphthalene, pyrrole and pyridine
3.7	Mechanism of electrophilic aromatic substitution in benzene w.r.t. nitration, sulphonation, halogenations and Friedel-Craft's reaction: alkylation and acylation
4	Alcohols and Phenols (08)
4.1	A) Alcohols: 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
4.2	B) Phenols: Introduction, Reactions of phenol (carbolic acid) : 1. Acylation and Fries rearrangement 2. Ether formation and Claisen rearrangement 3. Gattermann Synthesis 4. Carboxylation – Kolbe's reaction 5. Reimer – Tiemann reaction and its mechanism
	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 ArunBahl
7.	A Guide book to Mechanism in Organic Chemistry: Peter Sykes
8.	Textbook of Organic Chemistry: P. L. Sony

9.	Practical Organic Chemistry: A. I. Vogel
10.	Advanced Organic Chemistry: Reactions, Mechanism and Structure: Jerry March
11.	Organic Chemistry: M. R. Jain
12.	Organic Chemistry: J. M. Shaigal
13.	Organic Synthesis: Smith

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year BSc Chemistry (Paint Technology) Semester-IV Vertical: DSC-2-5 Course Code: Course Name: General Chemistry Practical Lab-III
*Teaching Scheme Practical: 02 Hours/week, 01 Credit	*Examination Scheme UA: 15 Marks CA: 10 Marks

Course Preamble: General Chemistry Practical is one of the minor practical courses in the Chemistry curriculum. This course provides an in-depth understanding of the Quantitative analysis. Combining the theoretical knowledge with hands on practicals will help students to develop practical skills in analyzing and optimizing the organic chemistry concepts.

	Course Objectives:
•	To develop practical skills in basic and conceptual Organic Chemistry.
•	To gain practical knowledge by applying the experimental methods to correlate with the theory.
•	Gain the knowledge of preparation of derivatives of organic compounds.
•	To know the type of reaction and mechanism involved in the preparation.
	Course Outcomes:
	On successful completion of this practical course student will be able to:
CO1	Understand practical skills.
CO2	Correlate theoretical concepts with experiments.
CO3	Prepare the organic compounds quantitatively
CO4	Understand the type of reaction and mechanism involved in the preparation.

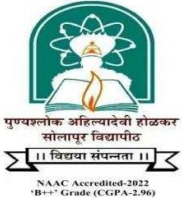
	List of Experiments
	Organic Quantitative Analysis: Organic Preparations (Any Four) 1. Preparation of phthalimide from phthalic anhydride. 2. Preparation of p-bromo acetanilide from acetanilide. 3. Preparation of m-dinitrobenzene from nitrobenzene using NaNO_2 and conc. H_2SO_4. 4. Preparation of acetanilide from aniline using acetic acid and anhydrous zinc chloride. 5. Preparation of p-nitro ethyl benzoate 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. DastaneRamchandra& 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, SunitaDhingra. 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. singh, I. R. Siddiqui et.al, Pragatiprakashan.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संयन्त्रता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B. Sc. Chemistry (Paint Technology) Semester-IV Vertical: DSC2-6 Course Code: Course Name: General Chemistry-IV (Pigments, Solvents and Additives)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: The paint and coatings industry is a rapidly expanding sector, playing a crucial role in both decorative and industrial applications, and contributing significantly to the national economy. This growth is driven by infrastructure development, improved living standards, industrial expansion, and the increasing demand for protective coatings on various surfaces. To meet the growing demand, there is a significant need for trained and qualified personnel who can take on leading roles in the industry.

	Course Objectives:
1.	The objective of this course is to enable the students:
2.	To understand the basic concepts about paints, their ingredients, functions of various ingredients and classification of paints.
3.	To understand composition and properties of various ingredients.
4.	To understand the methodology of formulation and manufacture of paints.
5.	To understand the methods of testing of paints and their raw materials.
6.	To understand about surface preparation and application of paints on various surfaces.
	Course Outcomes: On the successful completion of the course, students will be able to:
CO1:	Understand the basic concepts about paints, their ingredients, and functions of ingredients and classification of paints. Understand
CO2:	Understand the composition and properties of various raw materials for paints. Understand
CO3:	Learn the process of formulation and manufacture of paints. Apply
CO4:	Test the paints and their raw materials. Apply
CO5:	Prepare and paint various types of substrates Apply
CO6:	Prepare and paint various types of substrates Apply
Unit I:	Basics aspects and concepts 15 Periods
(A)	Pigments (07) Pigments: Definition, classification of pigments, forms of colourants, selection criteria of pigments, colour and structure of pigments, properties of pigments
(B)	Organic & Inorganic pigments (08) Inorganic pigments: TiO ₂ , Prussian Blue, Iron Oxide, Chrome Pigments, Carbon Black, anti-corrosive pigments, Extenders, CaCO ₃ , BaSO ₄ , Silicates etc. Zinc Oxide, White Lead etc Organic Pigments, Important parameters in the manufacturing of organic pigments
Unit-II	Solvents and additives 15 Periods
(A)	Solvents: (08) Solvents: Types of solvents, Characteristics of Solvents, Solvent power, Solvent Index, Rate of Evaporation of Solvents, Thinners, Diluents, Dilution Ratio
(B)	Additives: (07)

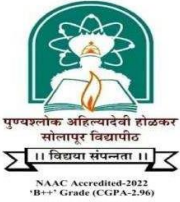
	Additives: Dryers, Levelling agents anti-skinning agents, wetting and dispersing agents, anti-settling agents, biocides, UV Light stabilizers etc.
	Reference Books
1.	Organic Coating Technology, Vol. I & II; by HF Payne.
2.	Outlines of Paint Technology; by W.M Morgan.
3.	Surface Coatings, Vol. I & II; by OCCA, Australia.
4.	Basics of Paint Technology (Part I & II); by Malshe&Sikchi.
5.	BIS Specifications IS:33-.1992, IS:74.1979, IS:101.1964
6.	Polymer Science By V.R.Gowariker Publisher New Age International
7.	Paint Pigment Solvent Coating Emulsion Paint Additives and Formulations (PB) Paperback – 1 January 2008by EIRI (Author)
8.	Paints, Pigments, Varnishes & Enamels Technology Handbook (with Process & Formulations) 2nd Revised Edition, Author: NIIR Board of Consultants and Engineers
9.	Additives for Coatings Edited by Johan Bieleman

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 "B++" Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year B.Sc.(Chemistry) Paint Technology Semester- IV Vertical : DSC2-6P Course Code: Course Name: General Chemistry Paint Technology Practical Lab-IV(Pigments, Solvents and Additives))
*Teaching Scheme Lectures:02 Hours/week, 01 Credit	*Examination Scheme UA: 15 Marks CA: 10 Marks

Course Preamble: This course will provide a hands-on, practical introduction to paint technology, covering the fundamentals of paint composition, application, and performance. It will involve theoretical sessions, practical demonstrations, and qualitative analysis of paints and coatings. Students will gain practical skills in preparing and evaluating various paint types, enhancing their understanding of the industry.

	Course Objectives:
1.	To provide students with a solid foundation in the basic principles of paint technology.
2.	To develop practical skills in preparing, applying, and evaluating paints.

3.	To introduce students to the latest trends and advancements in paint technology.
4.	To prepare students for careers in the paint industry or related fields.
5.	To acquire skills in handling the oils used in Paint.
	Course Outcomes: After completion of the course students will be able to
CO1:	Have understanding of the oils used in Paint.
CO2:	Understand about the of Solvents used in Paint
CO3:	Understand about the driers and other additives.
CO4:	Enhance the practical skill
	Pigments, Solvents and Additives(Any four)
1.	Preparation of Acrylic Emulsions.
2.	Preparation of Polystyrene by bulk polymerization.
3.	Preparation of Polyacrylate by solution/ polymerization
4.	To synthesize alkyd resins and test acid value and drying value
5.	To synthesize urea formaldehyde resin and test the solubility.
6.	To synthesize phenolic resin and test the solubility and softening point .
7.	To prepare medium oil alkyd resin and test the acid value
8.	To prepare oil and resins varnish.
	Reference Books
1	Basics of Paint Technology- Part- 1 By V.C.Maliha, Meenal. A.Sikchi
2	Organic Coating Technology vol-1 By Henry Fleming, Payne Publisher John Wiley & Sons.
3	Surface Coatings : Raw materials & their usage Volume-1 By OCCA-Australia Publisher Champas& Hall
4	Outlines of Paint Technology By W M Margans Publisher Edward Arnold., London
5	The Chemistry of Organic film formers By D.H.Solomon , R.E.Kriegar
6	Surface Coatings: Science & Technology By Swaraj Paul Publisher John wiley& Sons.

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्याया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year BSc Chemistry (Paint Technology) Semester-IV Vertical : GE/OE 4 Course Code: Course Name: Chemistry-GE/OE-4 (Chemistry for Competitive Examination-II)
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*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks
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Course Preamble: Chemistry-GE/OE-4 is one of the courses in the Chemistry curriculum. This course provides basic knowledge of chemistry required for competitive examination. This course consists of four chapters which covers the topics like Periodic table, metals and non-metals, acids, bases and salt, and chemical reactions.

	Course Objectives:
•	To know the structure of periodic table
•	To understand the properties of elements
•	To know basics of metals and non-metals
•	To understand the chemical reactions
	Course Outcomes: After completion of the course students will be able
CO1:	To know the basic structure of periodic table
CO2:	To understand the periodic trends of properties in modern periodic table
CO3:	To understand the physical properties of metals and non-metals
CO4:	To know theories of acids and bases
CO5:	To write the balanced chemical reactions
Unit I	15L
1	Periodic table: 07
1.1	Introduction
1.2	Doberiener's triads, Newlands law of octaves
1.3	Mendeleev's periodic table, Merits and demerits of Mendeleev's periodic table
1.4	Modern periodic table: Groups and periods, Groups and electronic configuration, Periods and electronic configuration,
1.5	Periodic trends in modern periodic table
1.6	s-block elements, p-block elements, d-block elements and f-block elements.
2	Metals and Non-metals: 08
2.1	Classification of element: Metal, Non-metal and Metalloid.
2.2	Metal: Physical properties, chemical properties and uses.
2.3	Non-metal: Physical properties, chemical properties and uses.
2.4	Metalloids: Physical properties, chemical properties and uses.
2.5	Uses of Noble gas elements
2.6	Metallurgy: Introduction, Occurrence of metal, 1) Concentration of ore 2) Extraction of metal
Unit II	15L
3	Acids, Bases and Salts: 07
3.1	Introduction
3.2	Arrhenius theory of acids and bases
3.3	Classification of Acid and Bases: 1) Organic acid and mineral acid 2) strong and weak acids, bases and alkali 3) Dilute and concentrated acids and bases.
3.4	Basicity and acidity,
3.5	Concentration of acid and base, pH of solution

3.6	Domestic and laboratory indicators, Universal indicators
3.7	Reactions of acid and bases and Uses of some selected acid and bases
3.8	Ionic compounds and electrical conductivity
3.9	Salts, Types of salts: acidic, basic and neutral salts, Some important salts
3.10	Buffer solutions
4	Chemical Reactions: 08
4.1	Chemical reactions, Writing of chemical reactions
4.2	Types of chemical reaction: Combination reaction, Decomposition reaction, Displacement reaction, Double displacement reaction, Oxidation reaction, Reduction reaction and Neutralization reaction.
4.3	Endothermic and Exothermic Reactions
4.4	Factors affecting on rate of reaction: 1) Nature of reactant 2) Size of the Particles of Reactants 3) Concentration of the reactants 4) Temperature of the Reaction 5) Catalyst.
	Reference Books:
1	General Chemistry- C. N. R. Rao
2	Organic Chemistry - Pine
3	Essentials of Physical Chemistry- Puri, Sharma and Pathania
4	Inorganic Chemistry- Puri, Sharma and Pathania
5	Essentials of Physical Chemistry- Bahl and Tuli
6	Advanced Physical Chemistry- Gurudeep Raj

	Punyashlok Ahilyadevi Holkar Solapur University, Solapur Second Year BSc(Chemistry) Semester-IV Vertical :VSC3 Course Code: Course Name: Chemistry-Practical Lab-V and VI (Inorganic + Paint Chemistry)
*Teaching Scheme Lectures:02 Hours/week, 02 Credits	*Examination Scheme UA:30 Marks CA: 20 Marks

Course Preamble: This is VSC based on DSC major course designed for the students to develop the practical skills. It also delivers vision to the students for laboratory effort to train about the new learnings.

	Course Objectives:
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•	To study the rates of chemical reactions
•	To find out the orders of chemical reactions
•	To determine the acidic and basic radicals from the given samples To ensuring the paint meets specified standards for color, consistency, and
•	other performance parameters.
•	TO assessing the paint's ability to adhere to substrates, withstand environmental conditions, and maintain its properties over time.
	Course Outcomes: After completion of the course students will be able
CO1:	To determine the rate constants of a studied reactions
CO2:	To predict the order and molecularity of the chemical reactions
CO3:	To plot the graphs and find out the rate constants from the slope
CO4:	To analyze the samples for the acidic and basic radicals
CO5:	To identifying the types and quantities of pigments, binders, solvents, and additives present in the paint sample.
CO6:	To evaluating the paint's adhesion, durability, drying time, corrosion resistance, and other relevant properties
I	Inorganic Chemistry Practicals
	Semi-micro Qualitative Analysis : (Any Three) Cations : Co^{++} , Al^{+++} , Fe^{+++} , Mn^{++} , Zn^{++} , Ni^{++} , Ba^{++} , Ca^{++} , Mg^{++} , NH_4^+ , K^+ Anions : Cl^- , Br^- , I^- , SO_4^{2-} , NO_3^- , CO_3^{2-}
II	Paint Technology Chemistry Practicals
1	Analysis of paint components including pigments, binders, solvents, and additives.
2	Testing paint properties involve determining viscosity using a viscometer, measuring drying time, evaluating adhesion, or testing for other specific properties like gloss or resistance to chemicals.
3	Troubleshooting and repair You might learn to identify and correct common painting defects like bleeding, blistering, or blooming.
	Reference Books
1.	Advanced Inorganic Analysis by Agrawal and Keemti Lal Pragati Prakashan
2.	Practical Inorganic Chemistry by Shikha Gulati, J L Sharma, Shagun Manocha, CBS Publishers And Distributors Pvt Ltd
3.	Practical Inorganic Chemistry (Paperback, Dr. L. Rakesh Sharma)

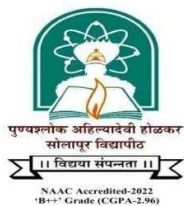
4.	Introduction to Semimicro Qualitative Analysis Paperback – 26 October 2004 by Theodore Brown H. LeMay, Bruce Bursten, Catherine Murphy, Patrick Woodward, Matthew Stoltzfus Pearson; 8th edition (26 October 2004)
5.	Textbook of semimicro inorganic qualitative analysis (English, Paperback, Dr. K. Nagaraj) Notion Press
6.	Resins for Surface Coatings, Volume 1 2nd Edition, Resins for Surface Coatings: Acrylics and Epoxies 2nd Edition by H. Coyard (Author), P. Deligny (Author), N. Tuck (Author), P. K. T. Oldring (Editor)
7.	Basics of Paint Technology Part II, Part 2, V. C. Malshe, Prakash C. Malshe, 2008 - Coatings - 624 pages
8.	Principles of polymerization, G.Odian, Wiley – Interscience (1981
9.	) Outlines of Paint Technology Hardcover – December 1, 2000 by Morgan (Author)

 पुण्यश्लोक अहिल्यादेवी होळकर सोलापूर विद्यापीठ ॥ विद्यया संपन्नता ॥ NAAC Accredited-2022 'B++' Grade (CGPA-2.96)	PunyashlokAhilyadeviHolkar Solapur University, Solapur Second Year BSc(Chemistry) Semester-IV Vertical :VSC4 Course Code: Course Name: Chemistry-Practical Lab-III and IV (Organic + Paint Chemistry)	
*Teaching Scheme Lectures:02 Hours/week, 02 Credits		*Examination Scheme UA: 30 Marks CA: 20 Marks

Course Preamble: This is VSC based on DSC major course designed for the students to excel the practical skills. It also delivers vision to the students for laboratory effort to train about the new learnings.

	Course Objectives:
●	To gain practical knowledge by applying the experimental methods to correlate with the theory.
●	Gain the knowledge of preparation of derivatives of organic compounds.
●	To know the type of reaction involved in the preparation.
●	To analyze the commercial sample
●	To determine the elements or compound present in the commercial samples.
●	To analyzing paint samples to identify their source, color, and composition, which can be crucial in criminal investigations.

•	To determining the specific functions of each component (pigment, binder, solvent, additive) in the overall paint formulation.
	Course Outcomes: After completion of the course students will be able to
CO1:	Understand practical skills.
CO2:	Correlate theoretical concepts with experiments.
CO3:	Prepare the organic compounds quantitatively
CO4:	Understand the type of reaction involved in the preparation.
CO5:	Understand the method used to determine amount from the commercial samples.
CO6:	Comprehend the sample preparation for titrimetric analysis.
CO7:	To using the analysis results to optimize paint formulations for improved performance, durability, and safety.
CO8:	To providing valuable information about the source, color, and composition of paint samples for criminal investigations.
	Organic Chemistry
	Preparations of derivatives of organic compounds (Any Four) i) Nitration of aromatic nitro hydrocarbon ii) Oximes of aldehydes & ketones iii) Picrate Aromatic hydrocarbon iv) Oxalate of amide v) Nitrate of amide
	Paint Chemistry
	Analysis (Any four)
1.	Identification of pigment and determine Acidity and Alkalinity
2.	To Determine Oil absorption value, bulk density, Bleeding tendency and Moisture Content of various Pigments
3.	. Preparation of an Azo pigment
4.	. Synthesis of whiting (CaCO ₃) and Iron Oxide Pigment
	Reference books
1.	Practical Inorganic Chemistry by Shikha Gulati, JL Sharma, ShagunManocha, CBS Publishers And Distributors Pvt Ltd
2.	Practical Inorganic Chemistry (Paperback, Dr. L. Rakesh Sharma)
3.	Introduction to Semimicro Qualitative Analysis Paperback – 26 October 2004 by Theodore BrownH. LeMay, Bruce Bursten, Catherine Murphy, Patrick Woodward, Matthew Stoltzfus Pearson; 8th edition (26 October 2004)
4.	Textbook of Semi-micro Inorganic Qualitative Analysis (English, Paperback, Dr. K. Nagaraj)Notional Press
5.	Polymer Chemistry: A Practical Approach (The Practical Approach in Chemistry Series)1st EditionFred J. DavisOxford University Press 2004 2
6.	Basics of Paint Technology Part I, V. C. Malshe. 4. Polymer Science by Gowarikar, John Wiley and Sons 1986.
7.	Resins for Surface Coatings, Polyurethanes Polyamides PhenoplastsAminoplasts Maleic Resins (Waterborne & Solvent Based Surface Coatings Resins & Applications) (Volume III) Volume III Edition



**PunyashlokAhilyadeviHolkar Solapur University,
Solapur**

Second Year BSc(Chemistry) Semester-IV

Vertical : AEC

Course Code: ENG-201

Course Name: English for Communication-Paper-II

***Teaching Scheme**

Lectures:02 Hours/week, 02 Credits

***Examination Scheme**

UA:30 Marks

CA: 20 Marks



**PunyashlokAhilyadeviHolkar Solapur University,
Solapur**

Second Year BSc (Chemistry) Semester-IV

Vertical: FP1/CEP1

Course Code:

Course Name: CC2

***Teaching Scheme**

Lectures:02 Hours/week, 02 Credits

***Examination Scheme**

UA: 30 Marks

CA: 20 Marks

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UA (Theory)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. (Part- II) w.e.f. AY 2026-27

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 (Theory and Practical) and UA (Practicals)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

B. Sc. (Part- I) w.e.f. AY 2025-26

Time:

Total Marks: 20

- **Theory Internal Evaluation System for 20 Marks**

- Choose any two of the following
- Home Assignment / Unit Test / Tutorial /Seminar

- **Practical Internal Evaluation System for 20 Marks**

- Any one practical from related paper

- **University Practical Evaluation System for 30 +30 Marks**

- Student has to perform 4 allotted experiments in 2 days

- **Passing Criteria:**

- University Theory Exam (UA) – 12 out of 30
 - University Practical Exam (UA) – 12 out of 30
 - College Theory Assessment (CA) – 08 out of 20
 - College Practical Assessment (CA) – 08 out of 20
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Note: Theory and practical examiners should be appointed from the list provided by the BOS as per section 48(3) of Maharashtra Public University Act 2016.