

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

(As per New Education Policy 2020)

Syllabus: Textile Design Technology

Apprenticeship Embedded Degree Programme (AEDP)

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

(Syllabus to be implemented from June 2026)



Punyashlok Ahilyadevi Holkar Solapur University, Solapur

Faculty of Science & Technology NEP 2020 Compliant Curriculum

B.Sc. (Textile Design Technology) Program Preamble

The Bachelor of Science (BSc) in **Textile Design Technology** is a comprehensive and dynamic program designed to provide students with a deep understanding of the fundamental principles of textile design, 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 BSc Chemistry program spans four years, with each year offering a progressively advanced curriculum designed to build a strong foundation in Chemistry while allowing for specialization and interdisciplinary learning. The curriculum is structured around several key components:

1. **Major Courses:** This program integrates textile science, textile design, yarn and fabric manufacturing, dyeing and printing, garment technology, textile testing, quality assurance, and sustainable textile processing to prepare students for careers in the textile, apparel, fashion, and technical textile sectors. Through comprehensive theoretical instruction and extensive hands-on laboratory training, graduates develop expertise in drug synthesis, quality control, process validation, and regulatory compliance.
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 and related fields.

7. **Research Methodology and Research Projects:** Research is a critical component of the BSc Textile Design 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 Textile Design Technology 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 Textile Design Technology**.
- **Year 2:**
After two years, students may choose to exit with a **Diploma in Textile Design Technology**.
- **Year 3:**
Completion of the third year qualifies students for a **BSc Degree in Textile Design Technology**.
- **Year 4:**
The fourth year offers an advanced curriculum with a focus on research, allowing students to graduate with an **Honors Degree in Textile Design Technology**.



**Punyashlok Ahilyadevi Holkar Solapur University,
Solapur**

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

**B.Sc. (Textile Design Technology)
Program Outcomes (PO)**

Students graduating from the Bachelor of Science in Textile Design 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 knowledge of medicinal chemistry principles and development, Perform qualitative and quantitative analysis of biomolecules and drug substances.

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.

Structure as per NEP-2020

B. Sc. I (Textile Design Technology)

Level	Sem	Major		VSC/ SEC	OE/GE	IKS	CC	Total Credits	Cumulative Credits
		T	P						
4.5	I	2	2	SEC1-2	---	L1- 2 IKS(General) 2 VEC 1-2	CC1-2	22	44
		2	2						
		2	2						
	II	2	2	SEC2 -2	OE1 /GE1- 2	L2-2 VEC 2	CC2-2	22	
		2	2						
		2	2						
S.No.	Course Type	Paper Title							Credit
1.	Major	Introduction to Textiles							2
2.	Practical based on DSC1-1	Practical Lab – I							2
3.	Major	General Physics							2
4.	Practical based on DSC2-1	Practical Lab – I							2
5	Major	Chemistry-I							2
6.	Practical based on DSC3-1	Practical Lab – I							2
7.	SEC-1	Processes of Textile Chemistry							2
8.	IKS	General IKS							2
9.	AEC	English							2
10	VEC	Constitution of India							2
11	CC1	CC							2
		Total							22
12	Major	Introduction to Dyes and Pigments							2
13	Practical based on DSC1 -2	Practical Lab - II							2
14.	Major	General Mathematics							2
15	Practical based on DSC2-2	Practical Lab – II							2
16.	Major	Chemistry-II							2
17	Practical based on DSC3-2	Practical Lab – II							2
18.	OE-I/GE-I	Computer for Chemist							2
19	SEC	Computer Skill Enhancement Course							2
20	AEC	English (Communication Skills)							2
21	VEC								
22	CC2	CC							2
		Total							22

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

Semester I

Semester I

DSC 1-1

Title of the paper: Introduction to Textile Chemistry

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

Course Objectives

1. Students should aware about India's historical role in global textile trade, current market potential, trends, and economic forecasts.
2. Grasp the fundamentals of fibers and colour scientific knowledge to dyeing.
3. Describe basic physicochemical aspects of dyeing on fibers.
4. Grasp science behind the pre-treatment to fibers, yarn and fabrics.
5. Preparatory steps in textile manufacturing.

1.	Introduction to textile fibre as polymer, Fibre forming characteristics of polymers, Definition of various basic textile terms, Introduction to Fibre, Yarn, Fabric, Classification of fibres based on sources of origin and on chemical constitution	6 h
2.	Natural fibres of plant, animal and mineral origin, commercially important fibres like cotton, jute, linen, bamboo, wool, silk etc	6 h
3.	Fibre structure, Polymer chemistry, monomers, Degree of polymerization, Corelation of fibre properties with its structure	6 h
4.	Manufacturing methods for Synthetic fibres such as polyester and its variants, polyamides, acrylic, polypropylene	6 h
5.	Manufacturing of Fabric: Introduction to fabric manufacturing, types of manufacturing, weaving, knitting and non-woven.	6 h

List of Textbooks/ Reference Books

1. Textile Fibres, Shenai V.A., Vol-1, Sevak Publications, Bombay, 3rd edition, 1991.
2. Mishra, S. P. A Textbook of Fibre Science and Technology. India: New Age International,
3. Ghosh, P. Fibre Science and Technology. United States: McGraw Hill Education (India) Private Limited, 2004
4. Kothari, V. Manufactured Fibre Technology. Netherlands: Springer Netherland, 2012
5. Visco-Elastic Properties of Polymers, Ferry, J.D., John Wiley and Sons, New York, 3rd
6. Polymer Science, V R Gowariker, New Age international (P) Ltd Publications, New

7. Weaving: Machines, mechanisms, management, Talukdar, M.K., Sriramulu P.K., Ajgaonkar D.B., Mahajan Publishers Private Ltd., Ahmedabad, 1998
8. Knitting technology, D. B. Ajgaonkar, Universal Pub, 1998
9. Nonwovens - Process, Structure, Properties and Applications; T Karthik, 2017

Course Outcomes

CO1	Understand Fibre forming characteristics of polymer and basic textile terms, like Fibre, Yarn, Fabric,
CO2	Understand Classification of fibres based on chemical constitution and source
CO3	Understand Fibre structure, basics of Polymer chemistry, monomers, Degree of polymerization
CO4	Understand primary synthetic manufacturing method
CO5	Understand basics of Fabric Manufacturing

DSC 1-1 Introduction to Textile Chemistry (Practical)

Credit: 02,

Practical: 60 Periods

Objectives

1. To grasp the Laboratory safety and best practices.
2. Enable students to develop scientific skills and carry out scientific investigations by applying the principles of Textile chemistry.
3. To give practical knowledge of textile materials.
4. To study the effect of operations on fiber substrate; dyestuff behavior, its interaction with fibers and dyeing mechanism.
5. To explain application of various dyes on natural fibers and effect of process parameters.

Practicals (Any Seven)

1. Laboratory format, safety, best practices.
2. Identification of fiber, and removal of oil and fats from given cotton fabric by scouring process.
3. Desizing of textile fabric by various methods.
4. Alkaline scouring and solvent assisted scouring of textile goods.
5. Bleaching of textile fabrics using Sodium Hypochlorite.
6. Bleaching of textile fabrics using Hydrogen Peroxide.
7. Pre-treatment of Silk.

8. Pre-treatment of Wool.
9. Chlorine bleaching of textile fabric.
10. Bleaching of textiles using potassium permanganate.
11. Dyeing of wool and silk with Basic Dye.
12. Dyeing of wool and silk with Acid Dye.

References

1. Gile's Laboratory Course in Dyeing, D G Duff and R S Sinclair, SDC Publ.
2. Textile Bleaching, Steven A.B., Pitman and Sons, London, 1947
3. Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Mahajan Publishers, Private Ltd., Ahmedabad, 1979.
4. Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar, 1999
5. Digital printing of textiles, Ujiie.H., Woodhead publishing, 2006 Textile finishing, D. Heywood, ed., Society of Dyers and Colourists, Bradford, England, 2003

Course Outcome:

1. A practical perspective behind textile process can be comprehended by students.
2. Theoretical knowledge based on principles and reactions, can be used in laboratory applications.
3. Analytical skills can be developed in the students which is an integral part of textile chemistry.
4. Students have understood application of various dyes on natural fibers and effect of process parameters.
5. Students have understood dyeing mechanisms suitable for various dyeing methods.

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

Credit: 02, Theory:

30 Periods

Course Objectives

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

Unit 1 Moment of Inertia**5hr**

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

Unit 2 Pendulums and Oscillations**5hr**

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

Unit 3 Elasticity**7 hr**

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

Unit 4 Surface Tension**7 hr**

Review of Surface Angle of contact and wettability, Capillary rise method Relation between excess pressure and surface tension, Excess pressure inside a liquid drop and soap bubble Jaeger's method to determine Surface Tension, Factors affecting Surface Tension

Unit 5 Viscosity**6 hr**

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

Course Outcomes

- On successful completion of this practical course student will be able to:
- Understood M. I. of the body and evaluate it.
- To get knowledge about different types of the pendulums and evaluate acceleration due to gravity.
- Gain knowledge about the elasticity of body and study the elastic properties of a body.
- To gain the knowledge about the mechanical properties of fluids.

Reference books

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

3. University Physics-Mechanics of a particle- Anvar Kamal
4. Mechanics Berkeley Physics course, V.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.
5. Concepts of Physics: H.C. Varma, Bharati Bhavan Publisher

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

Credit: 02,

Practical: 60 Periods

Course Objectives

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

Name of the Practicals

1. L. C. of various measuring instruments
2. Torsional pendulum
3. Bar pendulum
4. Bifilar pendulum
5. Moment of Inertia of disc by annular ring
6. Surface Tension by liquid drop method
7. Poisson's ratio
8. Viscosity by Stoke's method
9. Viscosity of water by Poiseuille's method
10. Moment of Inertia of a Flywheel.

DSC 3-1 Chemistry-I**Credit: 02, Theory:****30 Periods, 50 marks**

	Course Objectives:
•	To achieve knowledge of the gaseous states such as ideal and non-ideal gases, isotherm, and liquefaction of gases.
•	To acquire knowledge about rates of chemical reactions and distinguishing the reaction of a different order and their characteristics.
•	To proper understanding of covalent bonding using VBT and MOT approach.
•	To acquire knowledge of quantum mechanics, shapes of orbitals and periodic properties.
Unit 1:	
A	Gaseous State (07)
1.1	Ideal and Nonideal gases, Deviation from ideal behaviour.(Only Boyle's law),Causes of deviation from ideal behaviour, van der Waal's equation, explanation of real gas behaviour by van der Waal's equation.
1.2	Critical Phenomena: PV-Isotherms of real gases (Andrew's isotherms), continuity of state, Relationship between critical constants and van der Waal's constants.
1.3	Liquefaction of gases, Joule-Thomson effect.
1.4	Numerical Problems
B	Chemical Kinetics (08)
2.1	Chemical Kinetics and its scope, Rate of reaction, Definition and units of rate constant. Factors affecting rate of reaction, Concentration, pressure, temperature and catalyst: with example of Ammonia synthesis by Haber's Process.
2.2	Order and Molecularity of reaction.
2.3	First order reaction: Derivation of Rate constant, Characteristics of first order reaction, Example: Decomposition of N_2O_5
2.4	Second order reaction: Derivation of rate constant for equal and unequal concentration of the reactants. Characteristics of Second order reaction, Example: Reaction between $K_2S_2O_8$ and KI
2.5	Pseudo-uni-molecular reaction, Example: Hydrolysis of methyl acetate in presence of an acid.
2.6	Numerical Problems

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

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

Semester I

Title of the paper: Analysis of Textile Chemicals and Fibres

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

Sr. No.	Course contents (topics/subtopics)	Required hrs
1.	Identification of fibres by microscopic method	2
2.	Identification of fibres by chemical methods	2
3.	Identification of fibres from binary blends by chemical methods	2
4.	Identification of fibres from tertiary blends by chemical methods	2
5.	Quantitative analysis of blends	2
6.	Determination of count of yarn	2
7.	Fibre maturity measurements	2

8.	Fibre fineness by Cut-Weight Method	2
9.	Measurement of maturity and fineness by airflow instrument	2
10.	Determination of twist in double and single yarn	2
11.	To measure Yarn Appearance, Hairiness/yarn imperfections (Zwellager)	2
12.	To measure Yarn twist/Count	2
13.	To determine Types of weaves (Weave Diagram)	2
14.	To measure Fabric weight (GSM)	2
15.	To measure Fabric Count (Ends/pick, Wales/course)	2
16.	Determination of the single yarn strength and elongation at break of the yarns	2

List of Textbooks/ Reference Books

1	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol. - 3, 3rd edition, 2003.
2	Textile Bleaching, Steven A.B., Pitman and Sons, London.
3	Technology of Scouring and Bleaching, Trotman E.R., Griffin, London, 1968.
4	Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Mahajan Publishers Private Ltd., Ahmedabad, 1979.
5	Textile Chemistry, Peters R.H, Vol-2, Elsevier Publishing Company, London, 1967.
6	Sizing by D.B.Ajgaonkar, M.K.Talukdar and V.R.Wadekar
7	Mercerizing by J.T.Marsh
8	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar

Course Outcomes

CO1	Describe, carry out and use yarn twist/count, Appearance, Hairiness/yarn imperfections, fabric GSM.
CO2	Describe, interpret, examine and determine twist in double and single yarn,
CO3	Describe, interpret, examine and determine strength and elongation at break.
CO4	Carry out and use measurement of maturity and fineness of fibres by airflow instrument

Semester I

SEC1: Chemistry Skill Enhancement Course I (Processes of Textile Chemistry)

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

Course Objectives:		
1. Acquire the knowledge of sizing.		
2. Utilize various techniques for scouring and bleaching cotton.		
3. Brief study of machinery used for dyeing yarn and fabric machines.		
4. Recognize the various garment processing stages pretreatment, and printing, finishing.		
5. Different aspect of textile process.		
1.	Basic operations in textile wet processing – overall sequence, an overview of textile types and chemicals used	3
2.	Pretreatment: Singeing, Desizing, Scouring and Bleaching, Mercerization	6
3.	Dyeing: Classification of colorants, Classification of dyes based on fibre application, Basic dye structures, Dye – fibre bonds, Dyeing Mechanism, Selection of dye for a particular fibres class, roles of Dye auxiliaries	6
4.	Printing: Introduction to various colouration techniques, Different printing methods, Print paste ingredients & Its role, Merits and demerits of different printing methods Various special styles of printing	6
5.	Finishing of Textile: Objective of textile Finishing and type of finishing techniques, Mechanical finishes like Calendaring, sanforising. Chemical finishing – conventional softeners, stiffeners, binders, weighting agents, silicone finishes, speciality finishes.	6
6.	Machineries used in batch and continuous Wet processing.	3

List of Textbooks/ Reference Books

1.	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar, 1999
2.	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, Vol.3, 3rd edition, 2003.
3.	Technology of Dyeing, Shenai V.A., Vol. 6, Sevak Publication, Bombay, 1994.
4.	Technology of Printing, V. A. Shenai, Sevak Publications, Bombay, Vol. 4, 1990.
5.	Textile Printing by L. W. C. Miles, revised second edition published by SDC, 2003.
6.	Technology of Finishing, Shenai V.A., Vol. 10, Sevak Publication, Bombay, 1990.

Course Outcomes

CO1	Understand Overview of Basic operations involved in textile wet processing
CO2	Understand different Pretreatment methods with their pros and cons
CO3	Understand different Dyes and its application by dyeing on different fibres
CO4	Understand basics of printing and different techniques and methods of printing
CO5	Understand requirement of finishing and their types

Semester I

IKS (General)

Title of the paper: IKS General

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

Semester I

(CC1)

Title of the paper: CC

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

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

Semester II

Semester II

DSC 1-2**Title of the paper:** Introduction to Dyes and Pigments**Credit: 02, Theory: 30 Periods, Marks: 50****Course Objectives:**

The main objective of this subject is to study introduction of dyes & pigments their classifications, chemistry of aromatics, colour and chemical constitution.

1.	Introduction of Pigments, Colour Index Generic Names of Pigments, Colour Constitution Number, Polymorphism, Properties required in a pigment and extender, Pigment dispersion basics Classification of inorganic and organic pigments with examples, additive and subtractive colour mixing. Definitions of pigment, extenders, dyes, pigment dyestuffs, toner and lakes	5 h
2.	Theory of color formation in organic compounds, effect of auxiliary groups on the shade and hue of the pigment (Bathochromic and hyper chromic shift) Practices and requirement of Pigments	5 h
3.	Inorganic pigments such as titanium dioxide, zinc oxide, carbon black, chromate pigments, molybdate orange, chrome green. General methods of processing and synthesis of inorganic pigments: Crushing and grinding, vaporization, co precipitation, filtration, drying, flushing, calcinations/roasting, vapour phase oxidation etc. Raw materials for organic pigments: A brief study of coal tar distillation and the role of distillation products in the manufacture of synthetic dyes: bases and precipitants used in the colour striking, toners and lake formation	5 h
4.	Azo dyes: Diazotisation and coupling reactions, azoic colours, acid dyes, mono azo dye; diasazo, nitro, diphenylamine and anthraquinone dyes; acid mordant dyes, azo metal complex dyes, direct dyes	5 h
5.	Basic dyes: Diphenylmethane and triphenylmethane dyes and heterocyclic analogues thereof, triphenodioxazine dyes.	2 h
6.	Vat dyes: Indigoid, anthraquinonoid and polycyclic quinonoid dyes; solubilised vat dyes. Sulphur dyes and sulphurised vat dyes	2 h
7.	Reactive dyes: Chlorotriazine and other halo heterocyclic compounds, vinyl sulphone-based dyes, high fixation, highly substantive, neutral fixing bifunctional reactive dyes.	3 h
8.	Disperse dyes: azo, anthraquinone, dinitrophenylamine, methine dyes; properties in relation to constitution	3 h

List of Textbooks/ Reference Books

1	Color Chemistry, 3rd Edition, Heinrich Zollinger, Wiley – VCH 2003
2	Colorants and Auxiliaries: Colorants v. 1: Organic Chemistry and Application Properties, John Shore, Society of Dyers & Colourists; 2nd edition edition (Jan. 2002)
3	The Chemistry of Synthetic dyes, K. Venkataraman, Academic Press (1 January 1971)
4	Industrial Inorganic Pigments, Gunter Buxbaum, Wiley-VCH; 1 edition (March 11, 2005)
5	Industrial Organic Pigments: Production, Properties, Applications, 3 rd , Completely Revised Edition by Herbst, Klaus HungerWilly March 2006
6	Application Properties of Pigments By A.Karnik, First Edition Thane1999

Course Outcomes

CO1	Understand fundamental knowledge on basics of chemistry involved in the colorants.
CO2	Describe the types of pigments and their applications.
CO3	Compare the physical properties of pigments and dyes to differentiate them.
CO4	Illustrate synthetic methods used for azo dyes and their properties.
CO5	Identify types of dyes on the basis of application, properties and functional groups.

Semester II**Title of the paper: Practical Lab II****Credit: 02, Practical: 60 Periods, Marks: 50****Course Objectives:**

- To introduce students to the laboratory characterization of dyes, pigments, and intermediates using physical, chemical, and spectroscopic techniques.
- To impart practical skills in dyeing different textile fibres with various classes of dyes and to evaluate dyeing efficiency and colour properties.
- To develop competency in preparing dye formulations and pigment dispersions, studying the influence of process parameters, and correlating laboratory observations with industrial dyeing practices.

Sr. No.	Course contents (topics/subtopics)	Required hrs	
1.	Estimation of bleaching powder and sodium chlorite	2	
2.	Estimation of sodium silicate and sodium carbonate	2	
3.	Estimation of composition of alkali mixture and barium hydroxide	2	
4.	Estimation of Glauber's salt and sodium chloride	2	
5.	Estimation of chrome alum and hardness of water	2	
6.	Estimation of sodium hydrosulphite and Rangolite C	2	
7.	Estimation of formaldehyde and oxalic acid	2	
8.	Estimation of sodium alginate	2	
9.	Estimation of acid value and Iodine value of fatty acids	2	
10.	Estimation of efficiency of Sizing chemicals	2	
11.	Estimation of Chelating agents	2	
12.	Estimation of bleaching powder and sodium chlorite	2	

List of Textbooks/ Reference Books

1	Technology of Bleaching and Mercerizing, Shenai V.A., Sevak Publication, Bombay, 3, 3rd edition, 2003.
2	Textile Bleaching, Steven A.B., Pitman and Sons, London.
3	Technology of Scouring and Bleaching, Trotman E.R., Griffin, London, 1968.
4	Technology of Bleaching and Dyeing, Chakraverty, R.R., Trivedi S.S., Vol. 1, Eastern Book Publishers Private Ltd., Ahmedabad, 1979.
5	Textile Chemistry, Peters R.H, Vol-2, Elsevier Publishing Company, London, 1968.
6	Sizing by D.B.Ajgaonkar, M.K.Talukdar and V.R.Wadekar
7	Mercerizing by J.T.Marsh
8	Chemical Technology in the Pre-treatment Processes of Textiles by S.R.Karmakar

Course Outcomes

CO1	Estimate the purity of the different acids, alkali
CO2	Estimate the purity of the different Oxidising and reducing agents used in Textile wet processing
CO3	Estimate the efficiency of Sizing chemicals and Chelating agents
CO4	Estimate the acid value and Iodine value of fatty acids

	DSC1-1 Algebra and Calculus (Major) Credit-2 (Contact Hours-30)
	Unit I (A): [8] Matrices and Linear Equations: Elementary transformations, Rank of a Matrix (Echelon and Normal form), Characteristic equation of a matrix, Cayley Hamilton theorem and its use in finding the inverse of a matrix. Application of matrices to a system of linear (both Homogeneous and Non-homogeneous) equations, Eigen values and Eigen vectors. Unit I (B): [7] Complex numbers: Modulus and Argument of a Complex Number, De Moivre's Theorem and its applications, Roots of Unity, Roots of Complex Numbers Unit. II (A): [8] Differentiation: Successive differentiation, nth derivatives of some standard functions, Leibnitz's Theorem, Taylor's theorem and Maclaurin's Theorem (Statements only), Series expansions of e^x, $\sin x$, $\cos x$, $(1+x)^n$, $\log(1+x)$. Unit. II (B): [7] Function of two variables and Vector Calculus: Limit and Continuity of function of two variables, Partial derivatives, Partial derivative of higher orders, Homogeneous functions, Euler's Theorem on Homogeneous functions and its corollaries. Scalar point function, Vector point function, Gradient, Directional derivatives, Divergence, Curl and its properties.
	DSC1-2 Practical-I: Mathematics (Major) Credits-2.0 (Contact Hours- 60) 1. Assignment No. 1. Rank of Matrix. (Row echelon and Normal form) 2. Assignment No. 2. Inverse of Matrix by Cayley-Hamilton Method. 3. Assignment No. 3. Solution of system of Linear Homogenous and Non-homogenous equation 4. Assignment No. 4. Eigen values and Eigen vectors. 5. Assignment No. 5. nth roots of a complex number. 6. Assignment No. 6 Applications of Leibnitz's Theorem. 7. Assignment No. 7 Partial Differentiation 8. Examples on Euler's Theorem on Homogeneous functions Assignment No. 9. Numerical examples on directional derivative, gradient. 10. Assignment No.10. Numerical examples on divergence, curl.

	Semester II DSC 3-2 Title of the paper: Chemistry-II Credit: 02, Theory: 30 Periods, Marks: 50
	Course Objectives:
•	To study nature of bonding in organic molecules.
•	To inculcate the detailed basics of reaction mechanism and various intermediates
•	To study the different types of electronic effects.
•	To understand the stereochemistry of organic compounds.
•	To inculcate imagination and critical thinking of 3 D structures of organic compounds.
•	To study the unsaturated and alicyclic compounds.
•	To study the concept of aromaticity, its applications and reactions.
•	To know the important physical properties of liquids like viscosity, surface tension and refractive index.
•	To gain knowledge of ionic bonding and ionic solids.
•	To proper understanding of covalent bonding using VBT and MOT approach.
Unit 1:	
A	Fundamentals of organic reaction mechanism (05)
1.1	Introduction of reaction mechanism.
1.2	Types of arrow notations: Single headed curved arrow, Half headed curved arrow and double headed arrow.
1.3	Types of bonds breaking: Homolytic and Heterolytic
1.4	Types of reagents: Electrophilic and Nucleophilic
1.5	Types and sub-types of following organic reactions with definition and at least one example of each. a) Substitution b) Addition c) Elimination d) Rearrangement. (Mechanism is not expected)
1.6	Reactive Intermediates: Carbocations, Carbanions, Carbon free radicals, Carbenes, Nitrenes (Definition with suitable example, formation, structure, and relative stability)
B	Structure and Bonding (05)
2.1	Hybridization: sp^3 , sp^2 and p w.r.t. methane, ethylene and acetylene respectively
2.2	Bond length, Bond angle and Bond energy with factors affecting these properties w.r.t. sp^3 , sp^2 and sp hybridization.
2.3	Resonance effect w.r.t. phenol and nitrobenzene
2.4	Inductive effect, +I and -I
2.5	Strength of carboxylic acid w.r.t. inductive effect: Examples-a) Formic and acetic acid,

2.6	Hyperconjugation w.r.t. toluene
2.7	Steric effect w.r.t. mesitoic acid
C	Stereochemistry of organic compounds (05)
	Types of stereo-isomerism: Optical isomerism, Geometrical isomerism and Conformational isomerism
	Opticalactivity
	Essential conditions for Optical activity i. Elements of symmetry ii. Chiral center w.r.t. lactic acid
	Optical isomerism in lactic acid and tartaric acid
	Enantiomers and diastereoisomers w.r.t. 2,3-dihydroxybutanoic acid
	Racemic modification.
Unit 2:	
A	Physical properties of liquids (10)
4.1	Introduction, additive and constitutive properties
4.2	Viscosity, coefficient of viscosity, determination of viscosity by Ostwald's Viscometer
4.3	Surface tension: -Determination of surface tension by Drop-Weight method
4.4	Refractive index, Snell's law
4.5	Specific and molecular refractivity, Abbe's refractometer: Critical angle Principle, construction, working and advantages
B	Ionic Solids (05)
5.1	Ionic Bonding: a) Formation of ionic bond, Energetics of ionic bonding: Ionisation potential, Electron affinity and Lattice energy. b) Characteristics of ionic compounds. c) Born-Haber Cycle for Alkali metal halide (NaCl) d) Fajan's rules
5.2	Radius ratio and crystal structure. a) Definition: Radius ratio (r^+/r^-), Coordination number, Stoichiometry and unit cell. b) Concept and calculation of radius ratio (r^+/r^-) for ionic solid with octahedral geometry. c) Radius ratio effect on geometry d) Crystal structure of NaCl and CsCl unit cell, radius ratio, coordination number and stoichiometry.
C	Qualitative and Quantitative Analysis (06)
6.1	Qualitative analysis of Carbon, Hydrogen, Nitrogen & Sulphur
6.2	Quantitative analysis of Carbon and hydrogen by Combustion method, Nitrogen by Kjeldahl's method and Halogen and Sulphur by Carius method.

6.3	Determination of molecular weight of an acid by titration method.
6.4	Empirical formula and molecular formula determination.
6.5	Numerical Problems
	Learning Outcomes:
•	CO1: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
•	CO2: Able to predict the reactivity of organic molecules by the help of electronic effects.
•	CO3: Understand the basics of bonding and able to draw correct structure of any organic molecule and comment on its stability.
•	CO4: Understand the basic physical properties
•	CO5: To acquaint with instruments like refractometer, stalagmometer and viscometer
•	CO6: Explain ionic bonding and different parameters of crystal structure.
	Reference books:
1.	Organic Chemistry: Hendrickson, Cram, Hammond.
2.	Organic Chemistry: Morrison and Boyd
3.	Organic Chemistry: Volume I and III. L. Finar
4.	Organic Chemistry: Pine
5	Advanced Organic Chemistry: Sachinkumar Ghosh
6	Advanced Organic Chemistry: B.S. Bahland Arun Bahl
7	A Guide book to Mechanism in Organic Chemistry: Peter Sykes
8	Stereochemistry of Organic Chemistry: Kalsi,
9	Stereochemistry of Carbon Compounds: Eliel
10	Textbook of Organic Chemistry: P. L. Sony
11	Practical Organic Chemistry: A.I. Vogel
12	Advanced Organic Chemistry: Reactions, Mechanism and Structure: Jerry March
13	Organic Chemistry: M.R. Jain
14	Organic Chemistry: J.M. Shaigel
15	Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
16	Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
17	Harris, D.C. Quantitative Chemical Analysis, W.H. Freeman.
18	Dean, J.A. Analytical Chemistry Notebook, McGraw Hill.
19	Day, R.A. & Underwood, A.L. Quantitative Analysis, Prentice Hall of India
20	Gurudeep R Chatwal, Sham K Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House.
21	Barrow, G.M. Physical Chemistry Tata McGraw Hill (2007).

Semester II

Title of the paper: Practical Lab II

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

	Course Objectives:
•	To know the steps involved in organic compound identification
•	To understand the type of organic compound
•	To know about chromatography
•	To understand the estimation process
	List of Experiments
Sr. No.	Name of the Practical
	Organic Chemistry Organic Qualitative Analysis.
1.	Identification of at least four organic compounds with reactions including at least one from acids, phenols, bases and neutrals from the list of the compounds given below- • Acids: Oxalic acid, Benzoic acid and Cinnamic acid • Phenols: β - Naphthol, Resorcinol. • Bases : Aniline, p - Toluidine. • Neutrals: Acetone, Ethyl acetate, Glucose, Chloroform, Chlorobenzene, m-dinitrobenzene, Thiourea.
	Note: A systematic study of an organic compound involves the following operations which should be taught in details with reactions in the detection of elements and functional group. 1) Preliminary tests and physical examination 2) Determination of physical constant 3) Detection of Elements 4) Determination of functional group 5) Comparison with literature 6) Confirmatory Test 7) Summary 8) Result
	Organic Preparation: (Any one)
1.	i) Preparation of benzoic acid from benzamide. ii) Preparation of dibenzal acetone from benzaldehyde and acetone. (Wt. of crude product is expected. M.P. of the recrystallized product is not expected.)

	Analytical Chemistry - Determination of viscosity of given liquids A and B. (Density data of liquids, viscosity of water to be given.) [Any two liquids from, Acetone, CCl₄, Ethyl alcohol, Ethylene glycol and n-propyl alcohol] - Determination of refractive index and specific refraction of given liquids. [Any two liquids from, CCl₄, CHCl₃, benzene, xylene, toluene, ethyl alcohol]
1.	Estimations:(any one) - Estimation of aniline - Estimation of acetamide - Estimation of Aspirin Qualitative Analysis: - Spot Tests: Detection of following cations using spot tests: Cu²⁺, Co²⁺, Ni²⁺, Fe³⁺, Zn²⁺, Mg²⁺, Al³⁺, Pb²⁺. - Chromatography: Separation and identification of cations by Paper Chromatographic technique from the following mixtures: - Ni²⁺+Cu²⁺ - Ni²⁺+Co²⁺ - Cu²⁺+Co²⁺
	Any relevant practical's can be taken
	Reference Books:
	Experiments in Chemistry: D.V. Jahagirdar
	Vogel's Text Book of Quantitative Chemical Analysis (Longman ELBS Edition)
	Basic Concepts in Analytical Chemistry (Wiley Eastern Ltd.) : S. M. Khopkar
	Handbook of Organic Qualitative Analysis: Clarke
	Comprehensive Practical Organic Chemistry- Quantitative Analysis by V.K. Ahluwalia, Sunita Dhingra, University Press. Distributor - Orient Longman Ltd.,
	Comprehensive Practical Organic Chemistry preparation and Quantitative Analysis.:V.K. Ahluwalia, Renu Agarwal, University Press. Distributor- Orient Longman Ltd.,
	A laboratory Hand-Book of organic Qualitative Analysis and separation: V. S. Kulkarni, Dastane Ramchandra and Co. Pune.

Semester II (OE-I/GE-I) Title of the paper: Computer for Chemists Credit: 02, Theory: 30 Periods, Marks: 50	
	Course Objectives:
•	Grasp the principles of structured programming through the utilization of C.
•	Introduce students to the basic principles of programming and familiarize students with the syntax and semantics of the C language
•	Gain a comprehensive understanding of Internet technology.
•	Master the Hypertext Markup Language (HTML) for creating the structure and content of web pages, including semantic markup, forms, and multimedia integration.
Unit I	Basic of C: 15 hr
1	History, Features of C, Structure of 'C' programming, C Tokens, Data types, Operators, Control Statements Conditional control statements, Looping, Unconditional control statements
2	Arrays and String: Array definition and declaration, Types of array, Accessing Array, array manipulation, searching, insertion, deletion of an element from an array, basic matrix operations, dynamic array, String Declaration and Initialization, operation on string, inbuilt String handling functions, arithmetic operation on string, table of string.
Unit II:	Introduction to HTML, HTML5 and CSS 15 hr
1	Introduction: -Brief History of Internet, what is World Wide Web, URL, Domain, Internet Browser, What is Web Page and a Website, How the Website Works? Types of Websites (Static and Dynamic Websites)
2	HTML: - Introduction to HTML, Overview of basic HTML, Structure of HTML, Creating and opening HTML file, Singular and paired tags, Text formatting tag, Anchor tag, Lists, Image, Image Map, Table, Frames and Frameset, HTML Form
3	HTML5: Introduction to HTML5, Need of HTML5, DOCTYPE Element, Tags-Section, Article, aside, header, footer, nav, dialog, figure etc., Input tag (Type, Auto focus, placeholder, required etc. attributes.) in HTML5, Graphics in HTML5, Media tags in HTML5, Events in HTML5

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

Semester II Skill Enhancement Course (SEC 2) Chemistry Computer Skill Enhancement Course- Credit: 02, Practical's: 60 Hours Marks: 50		
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	Learning Objectives:
•	Gain a comprehensive understanding of office automation concepts, including its significance, benefits, and applications in modern workplaces.
•	Develop proficiency in using popular office productivity software suites such as Microsoft Office, Google Workspace, or other similar tools
•	Develop a comprehensive understanding of Internet technology and its underlying principles
•	Demonstrate mastery of Hypertext Markup Language (HTML) for structuring and presenting content on web pages, incorporating semantic markup, forms, and multimedia elements.
	List of Experiments
Sr. No.	Name of the Practical (Any Eight practical's)
1	Write a Program to convert the Temperature in centigrade degree to the Fahrenheit degree.
2	. Write a program to find out First Fifty Prime numbers.
3	Write a program to convert given Binary number into its Octal / Decimal, Hexadecimal equivalent.
4	Write a program to display Fibonacci series.
5	Write a Recursive function to find out the Factorial of Given Number.
6	Write a program to remove blank lines from a file.
7	Develop a simple shell program that can execute basic commands entered by the user.
8	Write a C program for implementation of Priority scheduling algorithms problem
10	Write a C program for implementation of Round Robin scheduling algorithms
11	Write a C program for implementation of FCFS scheduling algorithms. Write a C program for implementation of SJF scheduling algorithms.
12	Write a C program to simulate the concept of Dining-Philosophers
	Course Outcomes • Attain a thorough comprehension of office automation concepts, encompassing their significance, advantages, and contemporary workplace applications

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

Semester II

(CC2)

Title of the paper: CC2

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

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

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UA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

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

Time:

Total Marks: 30

Instructions

- 1) All Questions are compulsory
- 2) Figure to right indicate full marks.

Q.1 Choose correct alternative. (MCQ)

06 Marks

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

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

6 (2+2+2)

- A)
- B)
- C)
- D)
- E)

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

6 (3+3)

- A)
- B)
- C)

Q.4. Answer the following (Any two).

6 (3+3)

- A)
- B)
- C)

Q.5. Answer the following (Any one).

6 Marks

- A)
- B)

CA

Punyashlok Ahilyadevi Holkar Solapur University, Solapur.

Faculty of Science & Technology.

Nature of Question Paper for CBCS Pattern

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

Time:

Total Marks: 20

- **Internal Evaluation System for 20 Marks**

- Choose any two of the following
 - Home Assignment / Unit Test / Tutorial /Seminar
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- **Pattern of Examination:**

- External Evaluation + Internal Evaluation
- 30 Marks + 20 Marks = 50 Marks

- **Passing Criteria:**

- Written Exam – 12 out of 30
 - Continuous Assessment (CA) – 08 out of 20
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