



SECOND-YEAR OF BACHELOR OF SCIENCE
CHEMISTRY (MAJOR AND MINOR)
REVISED SYLLABUS ACCORDING TO CBCS
NEP2020

COURSE TITLE: CHEMISTRY-I
SEMESTER-IV
W.E.F. 2024-2025

**RECOMMENDED BY THE BOARD OF STUDIES IN CHEMISTRY
AND
APPROVED BY THE ACADEMIC COUNCIL**

Devrukh Shikshan Prasarak Mandal's
Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and
Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh.
Tal. Sangameshwar, Dist. Ratnagiri-415804, Maharashtra,
India

Academic Council Item No:

Name of the Implementing Institute	:	Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce, and Vid. Dadasaheb Pitre Science College (Autonomous), Devrukh. Tal. Sangameshwar, Dist. Ratnagiri-415804,
Name of the Parent University	:	University of Mumbai
Name of the Programme	:	Bachelor of Science
Name of the Department	:	Chemistry
Name of the Class	:	Second Year
Semester	:	Fourth
No. of Credits	:	02
Title of the Course	:	Chemistry-I
Course Code	:	S205CHT
Name of the Vertical in adherence to NEP 2020	:	Major and Minor
Eligibility for Admission	:	Any student admitted to Second Year of B.Sc. Degree Programme in adherence to Rules and Regulations of the University of Mumbai and Government of Maharashtra
Passing Marks	:	40%
Mode of Assessment	:	Formative and Summative
Level	:	UG
Pattern of Marks Distribution for SEE and CIA	:	40:60
Status	:	NEP-CBCS
To be implemented from Academic Year	:	2024-2025
Ordinances /Regulations (if any)		

Nya. Tatyasaheb Athalye Arts, Ved. S. R. Sapre Commerce and Vid. Dadasaheb Pitre Science College, Devrukh (An Autonomous College Affiliated with University of Mumbai)

Syllabus for Second Year of Bachelor of Science in Chemistry

(With effect from the academic year 2024-2025)

SEMESTER-IV

Paper No.– 1

Course Title: Chemistry-I

No. of Credits - 02

Type of Vertical: Major and Minor

COURSE CODE: S205CHT

Learning Outcomes Based on BLOOM's Taxonomy:

After completing the course, the learner will be able to...

Course Learning Outcome No.	Blooms Taxonomy	Course Learning Outcome
CLO-01	Remember	describe phase diagram of water system.
CLO-02	Understand	explain various reactions of acids.
CLO-03	Apply	differentiate between mono, bi, tri, poly dentate ligands.

Syllabus for Second Year of Bachelor of Science in Chemistry**(With effect from the academic year 2024-2025)****SEMESTER-IV****Paper No.– 1****Course Title: Chemistry-I****No. of Credits - 02****Type of Vertical: Major and Minor****COURSE CODE: S205CHT**

COURSE CONTENT			
Module No.	Content	Credits	No. of Hours
1	<p>1.1 Electrochemistry-II (3 hr)</p> <p>Electrochemical conventions, Reversible and irreversible cells. Nernst equation and its importance, Types of electrodes, Standard electrode potential, Electrochemical series (Numericals expected). Calculation of thermodynamic properties: ΔG, ΔH and ΔS from EMF data. (Numericals expected)</p> <p>1.2 Phase Equilibria (7 hr)</p> <p>Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. (Numericals expected) Phase diagrams of one-component systems (Water and Sulphur). Two component system (lead-silver system).</p> <p>1.3 Comparative Chemistry of the transition metals (5 hr)</p> <p>Position in the periodic table; Natural occurrence principal ores and minerals; electronic configuration, oxidation states and magnetic properties of 3d transition series; Origin of colour for transition metals and their compounds.</p>	01	15
2	<p>2.1 Carboxylic Acids and their Derivatives (7 hr)</p> <p>Nomenclature, structure and physical properties, acidity of carboxylic acids, effects of substituents on acid strength of aliphatic and aromatic carboxylic acids. Preparation of carboxylic acids: oxidation of alcohols and alkyl benzene, carbonation of Grignard and hydrolysis of nitriles.</p>	01	15

	<p>Reactions: Acidity, salt formation, decarboxylation, Reduction of carboxylic acids with LiAlH_4, diborane, Hell-Volhard-Zelinsky reaction, Conversion of carboxylic acid to acid chlorides, esters, amides and acid anhydrides and their relative reactivity.</p> <p>2.2 Sulphonic acids (3 hr) Nomenclature, preparation of aromatic sulphonic acids by sulphonation of benzene (with mechanism), toluene and naphthalene, Reactions: Acidity of arene sulfonic acid, Comparative acidity of carboxylic acid and sulfonic acids. Salt formation, desulphonation. Reaction with alcohol, phosphorous pentachloride, IPSO substitution.</p> <p>2.3 Coordination Chemistry (5 hr)</p> <p>Introduction to Chemistry of Coordination Compounds Basic terms and nomenclature. Types of ligands Isomerism: General Types with special reference to stereoisomerism of coordination compounds (C.N.-6)</p> <p>Theories of coordination compounds Werner's Theory of coordination compounds, Effective atomic number rule. Eighteen electron Rule</p> <p>Nature of the Metal-Ligand Bond Valence Bond Theory; Hybridization of the central metal orbitals-sp^3, $\text{sp}^3\text{d}^2/\text{d}^2\text{sp}^3$; Inner and outer orbital complexes (suitable examples of Mn(II) Fe(II), Fe(III), Co(II)/Co(III), Ni(II), Cu(II) Zn(II) complexes with ligands like aqua, ammonia CN^- and halides may be used) Limitations of V.B.T. Applications of coordination compounds.</p>		
	Total	02	30

Access to the Course

The course is available for all the students admitted for Second Year Bachelor of Science.

Methods of Assessment

The assessment pattern would be 40:60, 60% for Semester End Examination (SEE) and 40% for Continuous Internal Assessment (CIA). The structure of the SEE and CIA would be as recommended by the Board of Studies and approved by the Board of Examination and the Academic Council of the college.

References:

1. G. K. Vemulapalli, Physical Chemistry (2009): Phase Equilibria- Page No. 160-178.
2. Gurdeep Raj, Advanced Physical Chemistry, GOEL Publishing House (2012): Phase Rule- Page No. 1050-1089.
3. R. Gopalan, V. Ramalingam, Concise Coordination Chemistry (2001): Coordination Chemistry- Page No. 1-30.
4. Cotton & Wilkinson, Advanced Inorganic Chemistry, 6th Edition (2009): Transition Elements- Page No. 633-854.
5. Bahl and Bahl, A Textbook of Organic Chemistry, S. Chand Publication (2014): Carboxylic Acids- Page No. 426-451, 476.
6. R. L. Madan, Organic Chemistry (2010): Carboxylic acids & their derivatives- Page No. 476-522; Sulfonic acids- Page No. 579-590.
7. Brown, Foote, Iverson & Anslyn, Organic Chemistry, 6th edition, Brooks-Cole Publication: Carboxylic Acids- Page No. 681-721.