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

COURSE TITLE: CHEMISTRY-II
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-II
Course Code	:	S206CHT
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)		

Syllabus for Second Year of Bachelor of Science in Chemistry

(With effect from the academic year 2024-2025)

SEMESTER-IV **Paper No.– 2**

Course Title: Chemistry-II **No. of Credits - 02**

Type of Vertical: Major and Minor **COURSE CODE: S206CHT**

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 practical uses, environmental aspects of oxides and oxoacids and define Bragg's equation for interplanar distance in a crystal.
CLO-02	Understand	explain aromaticity and reactivity of furan, thiophene, pyrrole, pyridine predict the effect of substituents (electron donating and electron withdrawing) on basicity of amines.
CLO-03	Apply	differentiate between homogeneous-heterogeneous catalysis, acid-base catalysis, enzyme catalysis and classify cations and anions on the basis of acidity and basicity predominance diagrams.

Syllabus for Second Year of Bachelor of Science in Chemistry

(With effect from the academic year 2024-2025)

SEMESTER-IV **Paper No.– 2**

Course Title: Chemistry-II **No. of Credits - 02**

Type of Vertical: Major and Minor **COURSE CODE: S206CHT**

COURSE CONTENT			
Module No.	**Content**	**Credits**	**No. of Hours**
1	**1.1 Solid State (6 hr)** 1.1.1 Recapitulation of laws of crystallography and types of crystals 1.1.2 Characteristics of simple cubic, face centered cubic and body centered cubic systems, interplanar distance in cubic lattice (only expression for ratio of interplanar distances are expected) 1.1.3 Use of X-rays in the study of crystal structure, Bragg's equation (derivation expected), X-rays diffraction method of studying crystal lattice structure **1.2 Catalysis: (4 hr)** 1.2.1 Types of catalysis, catalytic activity, specificity and selectivity, inhibitors, catalyst poisoning and deactivation 1.2.2 Mechanisms and kinetics of acid-base catalyzed reactions, effect of pH. 1.2.3 Mechanisms and kinetics of enzyme catalyzed reactions (Michaelis-Menten equation) **1.3 Chemistry of Nitrogen family: (5 hr)** 1.3.1 Trends in chemical reactivity - Formation of hydrides, halides, oxides with special reference to oxides of nitrogen. 1.3.2 Oxides of nitrogen with respect to preparation and structure of NO, NO_2, N_2O and N_2O_4.	01	15
2	**2.1 Amines & Diazonium Salts (5 hr)** 2.1.1 Nomenclature, effect of substituent on basicity of aliphatic and aromatic amines; 2.1.2 Preparation: Reduction of aromatic nitro compounds using catalytic hydrogenation, chemical reduction using Fe-HCI, Sn-HCl, Zn-acetic acid, reduction of nitriles 2.1.3 Reactions: Salt Formation, N-acylation, N-alkylation, reaction with nitrous acid, carbylamine reaction, Electrophilic	01	15

	substitution in aromatic amines: bromination, nitration and sulphonation. 2.1.4 Sandmeyer reaction, Gattermann reaction, Gomberg reaction, Replacement of diazo group by -H, -OH. **2.2 Heterocyclic Compounds (5 hr)** 2.2.1. Classification, nomenclature, electronic structure of 5-membered and 6-membered rings containing one heteroatom; Aromaticity of heterocyclic compounds 2.2.2. Reactivity of furan, pyrrole and thiophene towards electrophilic substitution reactions on the basis of stability of intermediate and of pyridine on the basis of electron distribution. Reactivity of pyridine towards nucleophilic substitution on the basis of electron distribution. 2.2.3. Reactions of furan, pyrrole and thiophene: halogenation, nitration, sulphonation, Vilsmeier-Haack reaction, Friedel-Crafts reaction. 2.2.4. Acidity and basicity of Nitrogen containing heterocycles: Comparison of basicity of pyridine, pyrrole and piperidine, reduction and action of sodamide (Chichibabin reaction). **2.3 Ions in Aqueous Medium (5 hr)** 2.3.1. Acidity of Cations and Basicity of Anions i. Hydration of Cations; Hydrolysis of Cations, predicting degree of hydrolysis of Cations-effect of Charge and Radius. ii. Latimer Equation. Relationship between pKa, acidity and z^2/r ratios of metal ions graphical Presentation 2.3.2. Uses and Environmental Chemistry of volatile Oxides and oxo-acids i. Physical properties of concentrated oxo-acids like sulfuric, Nitric and Phosphoric acid ii. Uses and environments aspects of these acids		
	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. A. Bhal, B.S. Bahl, G.D. Tuli- Essentials of Physical Chemistry: Solid State- Page No. 481-528.
2. Charles Kittel, Introduction to Solid State Physics, 8th edition, John Wiley Publication: Solid State- Page No. 1-25.
3. Anthony R. West, Solid State Chemistry & its applications, 2nd edition, Wiley & Sons Ltd: Solid state- Page No. 1-18, 229-240.
4. K.L. Kapoor, A Textbook of Physical Chemistry, Volume 5, 4th edition, McGraw Hill: Catalysis- Page No. 168-194.
5. Gurdeep Raj, Advanced Physical Chemistry, GOEL Publishing House (2012): Catalysis- Page No. 841-872.
6. Santosh K. Upadhyay, Chemical Kinetics & Reaction Dynamics, Springer (2006): Catalysis- Page No. 142-172.
7. Shriver & Atkins', Inorganic Chemistry, 5th edition (2013): Chemistry of Nitrogen Family- Page No. 375-394.
8. Rayner-Canham & Overton, Descriptive Inorganic Chemistry, 6th edition, W. H. Freeman and Company (2014): Chemistry of Nitrogen Family- Page No. 386-403.
9. Jack Barrett, Inorganic Chemistry in Aqueous Solution, Tutorial Chemistry Texts (2003): Ions in Aqueous Medium- Page No. 13-70.
10. Bahl and Bahl, A Textbook of Organic Chemistry, S. Chand Publication (2014): Amines- Page No. 548-568; Heterocyclic Compounds- Page No. 850-872.
11. R. L. Madan, Organic Chemistry (2010): Amines, Diazonium Salts- Page No. 619-666; Heterocyclic Compounds- Page No. 836-877.
12. Clayden, Greevs, Warren & Wothers, Organic Chemistry, 2nd edition, Oxford University Press (2012): Heterocyclic Compounds- Page No. 723-750.
13. Brown, Foote, Iverson & Anslyn, Organic Chemistry, 6th edition, Brooks-Cole Publication: Amines- Page No. 947-960.