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**THIRD-YEAR OF BACHELOR OF SCIENCE  
CHEMISTRY (MAJOR)  
REVISED SYLLABUS ACCORDING TO CBCS  
NEP2020**

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**COURSE TITLE: CHEMISTRY-II  
SEMESTER-V  
W.E.F. 2025-2026**

**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: 02/2025

|                                               |   |                                                                                                                                                                     |
|-----------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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                             | : | Third Year                                                                                                                                                          |
| Semester                                      | : | Fifth                                                                                                                                                               |
| No. of Credits                                | : | 02                                                                                                                                                                  |
| Title of the Course                           | : | Chemistry-II                                                                                                                                                        |
| Course Code                                   | : | S302CHT                                                                                                                                                             |
| Name of the Vertical in adherence to NEP 2020 | : | Major                                                                                                                                                               |
| Eligibility for Admission                     | : | Any student admitted to Third 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                                         | : | 5.5                                                                                                                                                                 |
| Pattern of Marks Distribution for SEE and CIA | : | 40:60%                                                                                                                                                              |
| Status                                        | : | NEP-CBCS                                                                                                                                                            |
| To be implemented from Academic Year          | : | 2025-2026                                                                                                                                                           |
| 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 Third Year of Bachelor of Science in Chemistry

(With effect from the academic year 2025-2026)

**SEMESTER-V**

**Paper No.– II**

**Course Title: Chemistry-II**

**No. of Credits - 02**

**Type of Vertical: Major**

**COURSE CODE: S302CHT**

### 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 correlation diagrams of various molecules, properties of group 16 & 17 elements and find symmetry elements in the molecules. |
| CLO-02                      | Understand      | explain concept of point groups, superconductivity & properties of lanthanides.                                                       |
| CLO-03                      | Apply           | differentiate between homonuclear and heteronuclear diatomic molecules, lanthanides and actinides.                                    |
| CLO-04                      | Analyse         | solve numericals based on solid state chemistry and draw correlation diagrams.                                                        |

**Syllabus for Third Year of Bachelor of Science in Chemistry****(With effect from the academic year 2025-2026)****SEMESTER-V****Paper No.– II****Course Title: Chemistry-II****No. of Credits - 02****Type of Vertical: Major****COURSE CODE: S302CHT**

| <b>COURSE CONTENT</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                     |
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| <b>Module No.</b>     | <b>Content</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Credits</b> | <b>No. of Hours</b> |
| 1                     | <p><b>1.1 Molecular Symmetry and Chemical Bonding (8L)</b></p> <p>1.1.1 Molecular Symmetry<br/>Symmetry elements and Symmetry operations.<br/>Concept of a Point Group with illustrations using the following point groups: (i) <math>C_{\infty v}</math> (ii) <math>D_{\infty h}</math> (iii) <math>C_{2v}</math> (iv) <math>C_{3v}</math> (v) <math>C_{2h}</math> and (vi) <math>D_{3h}</math></p> <p>1.1.2 Molecular Orbital Theory for heteronuclear diatomic molecules and polyatomic species<br/>Comparison between homonuclear and heteronuclear diatomic molecules.<br/>Heteronuclear diatomic molecules like CO, NO, HCl<br/>Molecular orbital theory for <math>H_3</math>, <math>H_3^+</math>, <math>BeH_2</math>, <math>H_2O</math> (correlation diagram expected).</p> <p><b>1.2 Solid State Chemistry (7L)</b></p> <p>1.2.1 Structures of Solids<br/>Closest packing of rigid spheres (hcp, ccp), packing density in simple cubic, bcc and fcc lattices.<br/>Relationship between density, radius of unit cell and lattice parameters. (Numerical problems expected).<br/>Stoichiometric Point defects in solids (discussion on Frenkel and Schottky defects expected).</p> <p>1.2.2 Superconductivity<br/>Explanation of terms superconductivity, transition temperature, Meissner effect.<br/>Types &amp; brief applications of superconductors</p> | 01             | 15                  |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |           |           |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|
| 2 | <p><b>2.1 Chemistry of Inner Transition Elements (7L)</b></p> <p>2.1.1 Chemistry of Lanthanides<br/>Lanthanide contraction and its consequences, Oxidation states, Ability to form complexes, Magnetic and spectral properties, Applications of lanthanides</p> <p>2.1.2 Chemistry of Actinides<br/>Comparison between lanthanides and actinides, Chemistry of Uranium with reference to occurrence and isolation (solvent extraction method), Properties and applications of Uranium</p> <p><b>2.2 Comparative Chemistry of Group 16 (4L)</b><br/>Electronic configurations, trends in physical properties, allotropy, Manufacture of sulphuric acid by Contact process.</p> <p><b>2.3 Comparative Chemistry of Group 17 (4L)</b><br/>Electronic configuration, General characteristics, anomalous properties of fluorine, comparative study of acidity of oxyacids of chlorine w.r.t acidity, oxidizing properties and structures (on the basis of VSEPR theory)<br/>Chemistry of interhalogens with reference to preparations, properties and structures (on the basis of VSEPR theory)</p> | 01        | 15        |
|   | <b>Total</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>02</b> | <b>30</b> |

**Access to the Course**

The course is available for all the students admitted for Third 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. D. Banerjee, Coordination chemistry, Tata McGraw Hill, New Delhi, (1993).
2. D. F. Shriver and P. W. Atkins, Inorganic chemistry, 3rd Ed., Oxford University Press, (1999).
3. N. N. Greenwood and E. Earnshaw, Chemistry of elements, Pergamon Press, Singapore, (1989).
4. W. L. Jolly, Modern inorganic chemistry, 2nd Ed. McGraw Hill Book Co., (1991).
5. B. E. Douglas and H. McDaniel, Concepts and models in inorganic chemistry, 3rd Ed., John Wiley & Sons, Inc., New York, (1994).
6. G. N. Mukherjee and A. Das, Elements of bioinorganic chemistry, Dhuri and Sons, Calcutta, (1988).
7. R. W. Hay, Bioinorganic chemistry, Ellis Harwood, England, (1984).
8. R. C. Mehrotra and A. Singh, Organometallic chemistry: A unified approach, Wiley Eastern, New Delhi, (1991)

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