

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College**  
**Ahmednagar (Autonomous)**  
(Affiliated to Savitribai Phule Pune University, Pune)



**National Education Policy (NEP)**  
**Choice Based Credit System (CBCS)**

**Programme Framework and Syllabus for**

**Skill Enhancement Courses: Chemistry**

कौशल्य वृद्धी अभ्यासक्रम: रसायनशास्त्र

**Implemented from**

**Academic Year 2024-25**

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's  
**New Arts, Commerce and Science College, Ahmednagar**  
**(Autonomous)**

**Board of Studies in Chemistry**

Sr. No.	Name	Designation
1.	Prof. Dr. D. R. Thube	Chairman
2.	Asso. Prof. P. S. Mutkule	Member
3.	Asso. Prof. S. B. Dare	Member
4.	Dr. S. J. Takate	Member
5.	Asst. Prof. P. B. Gaikwad	Member
6.	Asst. Prof. A. V. Karande	Member
7.	Dr. N. R. Dhattrak (SPPU)	Vice-Chancellor Nominee
8.	Dr. B. B. Shingate (BAMU, Aurangabad)	Academic Council Nominee
9.	Dr. S. S. Kolekar (Shivaji University, Kolhapur )	Academic Council Nominee
10.	Dr. P. C. Mhaske (S. P. College, Pune)	Alumni
11.	Dr. D. N. Sawant (NCL, Pune)	Industry Expert

## **1. Prologue/ Introduction of the programme:**

Academics and research in India is a priority which depends upon the quality of education. Quality higher education includes innovations that can be useful for efficient governance of higher education institutions, systems and society at large. Fundamental approach to learning outcome-based curriculum emphasizes upon demonstration of understanding, knowledge, skills, attitudes and values in particular programme of study. This approach is intended to follow flexibility and innovation in design of the programme, its assessment and expect graduate attributes demonstrating the level of learning outcome. It is expected to provide effective teaching – learning strategies including periodic review of the programme and its academic standard. The learning outcome-based curriculum for B.Sc. degree in Chemistry is designed to address the needs of the students with chemistry as the core subject of study. The curriculum is expected to assist in the maintenance of the standard of chemistry degrees/programmes and periodic programme review within a broad framework of agreed/expected graduate attributes qualification descriptors, programme learning outcomes and course-level learning outcomes. The framework is intended to allow flexibility and innovation in programme design, syllabi development, teaching-learning process and quality assessment of students learning levels.

This curriculum for the bachelor-level program in Chemistry is developed keeping in view of the student centric learning pedagogy, which is entirely outcome-oriented and curiosity-driven. To avoid rote-learning approach and foster imagination, the curriculum is more leaned towards self-discovery of concepts. The curriculum focuses on pragmatist approach whereby practical application of theoretical concepts is taught with substantial coverage of practical and field works. The platform aims at equipping the graduates with necessary skills for Chemistry-related careers, careers with general graduate-level aptitude and for higher education in Chemistry and allied subjects. Augmented in this curriculum are graduate attributes including critical thinking, scientific reasoning, moral ethical reasoning, qualification descriptors that are specific outcomes pertinent to the discipline of chemistry, learning outcomes for individual courses, pedagogical methods and assessment methods. While designing syllabus, emphasis is given on the objectively measurable teaching-learning outcomes to ensure employability of the graduates. In line with recent trends in education section, this syllabus foster implementation of modern pedagogical tools and concepts such as flip-class, hybrid learning, MOOCs and other e- learning platforms. The framework is designed such a way to enable the learners implementing the concepts to address the real world problems. The curriculum focuses on issues pertinent to India and also of the west; for example, green chemistry and biomaterials etc. Curriculum are holistic and aim to mould responsible Indian citizen to have reflective thinking, scientific temper, and digital literacy in order to acquire requisite skill to be self-employed entrepreneurial.

## 2. Programme outcomes for B.Sc. Chemistry

Students enrolled in the program complete a curriculum that exposes and trains students in a full range of essential skills and abilities. They will have the opportunity to master the following objectives.

### Programme Outcomes

- To understand the basic facts and concepts in Chemistry
- To understand the importance of Chemistry in daily life.
- To develop a better understanding and reasoning of facts.
- Gain the knowledge of Chemistry through theory and practicals.
- To skill-up for basic analytical tools.
- To skill-up for various laboratory techniques used in pharmaceutical laboratories and chemical industries.
- To make efficient for various spectrometric analyses
- Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.
- Solve the problem and also think methodically, independently and draw a logical conclusion.
- Employ critical thinking and the scientific knowledge to design, carry out, record and analyses the results of chemical reactions.
- Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.
- Find out the green route for chemical reaction for sustainable development.
- To inculcate the scientific temperament in the students and outside the scientific community.
- To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
- Identify chemical formulae and solve numerical problems.
- Know structure-activity relationship.
- Understand good laboratory practices and safety.

### Skill Enhancement Courses: Framework and Course Distribution: Subject: Chemistry

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	II	5.0	SEC-01	SEC-CH 01P	Practical Skills in Chemistry	02
2.	II	III	5.5	SEC-02	SEC-CH 02P	MNO	02
3.	II	IV	6.0	SEC-03	SEC-CH 03P	MNO	02
<b>Total</b>							<b>06</b>

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**Skill Enhancement Courses: Chemistry**

Title of the Course: Practical Skills in Chemistry								
Year: I				Semester: II				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
<b>SEC-01</b>	<b>SEC-CH 01P</b>	00	02	02	<b>60</b>	15	35	50

**Learning Objectives:**

Students will-

1. learn synthesis of commercially important inorganic compounds.
2. learn volumetric estimation analysis of commercial product
3. understand chromatographic techniques.
4. get knowledge of types of organic reactions.

**Course Outcomes (Cos)**

After the completion of this course, student will be able to-

1. develop practical skills of the student.
2. prepare solutions of required concentrations and practice volumetric analysis.
3. learn simple inorganic preparations.
4. learn paper chromatography for separation of mixtures.
5. know volumetric analysis and its use in analysis of commercial products
6. perform purification of organic compounds and prepare simple organic compounds.

**Detailed Syllabus:**

Perform minimum 12 experiments

**Unit I: Safety in laboratory and workplace (Any two)**

1. Toxicity of chemical compounds and safety symbols for chemicals and their meaning.
2. Material Safety Data Sheet (MSDS) for chemicals and their importance.
3. Safety of electronic equipment and precautionary measures.

**Unit II: Purification of organic compounds (Any two)**

4. Crystallization of aspirin

5. Distillation of mixture of organic compounds like perfumes
6. Sublimation of camphor

**Unit III: Synthesis of commercially important compounds (Any two)**

7. Synthesis of alum as an antiseptic drug.
8. Preparation of Dark Red pigment:  $\text{Cu}_2\text{O}$  used in paints.
9. Synthesis of iodex as analgesic balm.

**Unit IV: Volumetric Analysis of food products (Any two)**

10. Preparation of molar and normal solutions necessary for chemical analysis.
11. Determination of acetic acid from food preservative (vinegar).
12. Determination of pH and acidity of carbonated drinks and fruit juices.
13. Determination of Hardness of water by E.D.T.A. method.

**Unit V: Analysis of medicinal products (Any two)**

14. Estimation of acid neutralizing capacity of antacid tablet.
15. Estimation of Aspirin from APC analgesic tablet.
16. Estimation of Ca from calcium tablet by complexometric titration.

**Unit VI: Paper chromatographic separations (Any two)**

17. Separation of commercial ink.
18. Separation of chlorophyll pigment from spinach leaves.
19. Separation of metal ions from Indian metal coins.

**Suggested Readings / Materials:**

1. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
2. Brian S. Furniss, Antony J. Hannaford, Peter W. G. Smith, Austin R. Tatchell Vogel's Textbook of Practical Organic Chemistry, John Wiley & Sons, New York, 5<sup>th</sup> ed, 2005.
3. Mann, F.G. & Saunders, B.C. Practical Org, Chemistry Orient-Longman, 1960.
4. Vogel's Textbook of Quantitative Chemical Analysis, 5<sup>th</sup> Ed.
5. Experiments in Chemistry, D.V. Jahagirdar, Himalaya Publication.
6. Khosla, B.D.; Garg V.C. & Gulati A., Senior Practical Physical Chemistry, R. Chand & Company, New Delhi, 2011.
7. Experiments in Chemistry, D. V. Jahagirdar, Himalaya Publication.