Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Structure and Curriculum of Four Year Multidisciplinary Degree (Honors/Research) Programme with Multiple Entry and Exit option

Undergraduate Programme of Science and Technology

B.Sc. in Analytical Chemistry

Board of Studies

in

Chemistry

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

w.e.f. June, 2026

(In Accordance with NEP-2020)

Review Statement

The NEP Cell reviewed the Curriculum of **B.Sc. in Analytical Chemistry** to be effective from the **Academic Year 2026-27.** It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: - 13/04/2026

Place: Latur

NEP CELL

Rajarshi Shahu Mahavidyalaya, Latur

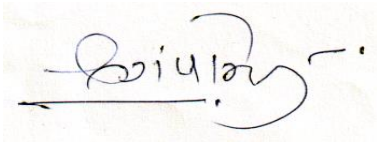
Empowered Autonomous Institution

CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the Curriculum of **B.Sc. in Analytical Chemistry** Programme to be effective from the **Academic Year 2026-27.**

Date: 11/04/2026

Place: Latur



Prof. Dhananjay Palke

Chairperson
Board of Studies in Chemistry
Rajarshi Shahu Mahavidyalaya, Latur
Empowered Autonomous Institution

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Members of Board of Studies in the Subject Analytical Chemistry
Under the Faculty of Science and Technology

Sr. No.	Name	Designation	In position
1	**Prof. Dhananjay Palke** Head, Department of Chemistry, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur	Chairperson	HoD
2	**Dr. Jaman A. Angulwar,** Dayanand Science College, Latur	Member	V.C. Nominee
3	**Dr. Bapurao Shingate,** Professor, Department of Chemistry, BAMU Chhatrapati Sambhaji Nagar	Member	Academic Council Nominee
4	**Dr. Dipak Dalal,** Professor & Director, KBC NMU, Jalgaon	Member	Academic Council Nominee
5	**Dr. S. H. Gaikwad** Shivaji Mahavidyalaya, Barshi	Member	Expert from outside for Special Course
6	**Dr. Harichandra Parbat** Wilson College, Mumbai	Member	Expert from outside for Special Course
7	**Mr. Amol Bhadule,** Syngene International, Bengaluru	Member	Expert from Industry
8	**Dr. Vinod Jadhav** Aragen Life Sciences, Hyderabad	Member	P.G. Alumni
9	**Dr. K. I. Momin** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member
10	**Dr. K. C. Tayade** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member

Sr. No.	Name	Designation	In position
11	**Mr. M. S. Sudewad** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member
12	**Mr. A. A. Bhandare** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member
13	**Mr. V. M. Dhumal** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member
14	**Ms. H. K. Sayyed** Assistant Professor, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur-413512	Member	Faculty Member

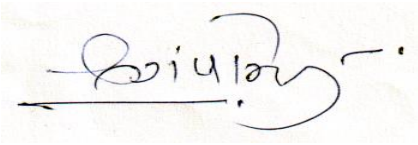
From the Desk of the Chairperson…

Dear Colleagues and Students,

I am pleased to share that the Board of Studies in Analytical Chemistry is regularly gearing up to review and update our curriculum to reflect the latest advancements in the field. As part of this effort, we aim to timely incorporate emerging trends and technologies, ensuring our students are industry-ready and equipped with the skills required to tackle real-world challenges.

The proposed changes are focused on enhancing the practical skills of our students, with more emphasis on hands-on training and research-oriented projects. We are continuously working to introduce new courses that cater to the growing demand for specialized skills in areas like modern instrumental analysis, environmental analytics, etc.

I invite all the chemistry & analytical chemistry fraternity to share their suggestions and feedback on the syllabus. Your input is invaluable in shaping the future of our curriculum and hence invariably the future generations.



Best regards,
Prof. (Dr.) Dhananjay Palke
Chairperson, Board of Studies in Analytical Chemistry

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Faculty of Science & Technology

Department of Analytical Chemistry

Programme Specific Outcomes (POs) for Analytical Chemistry	
PO No.	After completion of this programme the students will be able to -
PO 1	**Disciplinary Knowledge and Skills:** (i) Demonstrate comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in analytical chemistry and other related interdisciplinary subfields such as life, environmental and material sciences (ii) Use modern instrumentation for chemical analysis and separation.
PO 2	**Skilled Communicator:** Effectively communicate complex technical information relating to analytical chemistry clearly and concisely in writing and oral skills
PO 3	**Critical Thinker and Problem Solver:** Critically evaluate analytical methods & results and analyze and solve problems related to chemical analysis and quality control.
PO 4	**Sense of Inquiry:** Ask relevant/appropriate questions relating to issues and problems in the field of analytical chemistry, and planning, executing and reporting the results of an experiment or investigation
PO 5	**Team Player & Industry Readiness:** Work effectively in diverse teams in both classroom, laboratory and in industry, research settings and field-based situations.
PO 6	**Skilled Project Manager:** Identify/mobilise appropriate resources required for a project, and manage a project through to completion, while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.
PO 7	**Digitally Literate:** Utilize computer-based simulations and specialized software to perform chemical analysis and data processing.
PO 8	**Research Aptitude:** Undertake research projects and apply analytical techniques.
PO 9	**Ethics, Professionalism, Reasoning & Data Analysis:** Maintain high ethical standards by reporting accurate data and avoiding misconduct like falsification or plagiarism. Additionally, prioritize environmental sustainability while ensuring all analytical findings are interpreted and shared with total integrity.
PO 10	**Lifelong Learners:** Learn in self-paced and self-directed way aimed at personal development and for improving knowledge/skill development and reskilling.

Programme Specific Outcomes (PSOs) for Bachelor of Science in Analytical Chemistry	
PSO No.	After completion of this programme the students will be able to -
PSO 1	**Analytical Techniques Proficiency:** Acquire skills in chemical separation (crystallization, distillation, and chromatography) and identification techniques, including titration and gravimetric analysis.
PSO 2	**Instrumental Analysis:** Develop the ability to operate, maintain, and interpret data from modern analytical instruments like UV-Vis spectroscopy, IR spectroscopy, Mass Spectrometry and Chromatography.
PSO 3	**Data Interpretation & Reporting:** Ability to collect accurately, process, analyze, and interpret quantitative chemical data using statistical methods.
PSO 4	**Laboratory Safety & Best Practices:** Understand and strictly adhere to good laboratory practices (GLP), safety regulations, and proper chemical handling.
PSO 5	**Problem-Solving & Application:** Apply chemical principles to solve practical problems in industry, such as quality control, environmental analysis, and pharmaceutical analysis.
PSO 6	**Research & Professional Skills:** Develop research-oriented skills suitable for higher studies or employment in industrial, government, or educational sectors.
PSO 7	**Methods Development & Validation:** Create new methods for analysis and validate them.

Shiv Chhatrapati Shikshan Sanstha's

Rajarshi Shahu Mahavidyalaya, Latur

Empowered Autonomous Institution

Department of Chemistry & Analytical Chemistry
B.Sc. I Semester-I

Course Type: SEC
Course Title: Basic Concepts in Analytical Chemistry
Course Code: 101ACH1601/101ACH2601
Credits: 02 (1T+1P) **Max. Marks: 50** **Lectures: 45 Hrs.**

Learning Objectives:

The objective of this course is to enable the learner to:

LO 1. Precision in Measurement: Establish a foundation in the International System of Units (SI) and the mathematical principles of scientific data.
LO 2. Stoichiometric Quantification: Develop proficiency in the relationship between physical mass and chemical amount of substance.
LO 3. Solution Preparation & Analysis: Provide a comprehensive understanding of various concentration expressions and their practical applications.
LO 4. Laboratory Reagent Management: Teach the technical skills required for handling commercial reagents and logarithmic data scales.

Course Outcomes:

On completion of this course, the learner will be able to:

CO 1. Apply SI base and derived units to scientific measurements while maintaining appropriate significant figures in all calculations.
CO 2. Perform conversions between mass, moles, and molar mass to quantify chemical species for laboratory reactions.
CO 3. Calculate and prepare solutions using molarity (analytical/equilibrium), formality, percent, and trace concentrations (ppm/ppb).
CO 4. Execute precise dilution procedures using volume ratios and convert concentrations into logarithmic p-functions.

Unit No.	Title of Unit & Contents	Hrs.
I	**Systematic Internal and Derived Units (SI Units)**	**04 Hours**
	Definitions of the Seven Base Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current, and Luminous intensity), Derived units, Conversion between units.	
	Unit Outcomes:	
	UO 1. Understand the seven base units and recognize derived units.	
	UO 2. Identify the appropriate base unit for measuring specific physical properties in laboratory or scientific contexts.	

II	**Significant Figures & Rounding**	**02 Hours**
	Significant Digits, Significant figures, Rounding Off- Subtypes of Rounding Techniques, Rounding by Calculation Type	
	Unit Outcomes:	
	UO 1. Identify and Apply Significant Figure Rules in Calculations.	
	UO 2. Employ Specific Rounding Subtypes and Techniques.	
III	**Fundamentals of Atomic and Molecular Calculations**	**03 Hours**
	i) Atomic Weight, molar mass ii) Empirical Formula, Molecular Formula ii) Mole Concept and Stoichiometry, Millimoles, iii) Calculations in grams and moles	
	Unit Outcomes:	
	UO1. Understand Quantitative Composition and Formula Determination	
	UO2. Explain Mole Concept and Perform Stoichiometric Calculations.	
IV	**Solutions and their Concentrations**	**06 Hours**
	a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million/ billion (ppm, ppb) f) Volume ratios for dilution procedures g) p-functions h) Formality i) Commercial Laboratory Reagents	
	Unit Outcomes:	
	UO1. Insight about Fundamental Principles of Solution Concentration and Expression	
	UO2. Apply the Knowledge for Practical Laboratory Applications, Reagents, and Dilutions	

Experiments: (Minimum 08 Experiments)

1. Calculation of weight of solid required to prepare N/20 NaOH and its solution preparation.
2. Standardization of the solution.
3. Determination of concentration of industry received laboratory reagents.
4. Preparation of standard solution of EDTA (not in salt form).
5. Identification of HCl, HNO_3, and H_2SO_4 kept in various beakers by various tests.
6. Identification of pH of various reagents using pH papers
7. Basic lab skill in analytical chemistry practical.
8. Introduction to volumetric measurement glassware.
9. Preparation of desiccator.
10. pH jump study of selected indicators.
11. To identify the use of various apparatus and utensils used in chemical laboratory.

Learning Resources:

1. Petrucci, Harwood, Herring. General Chemistry: Principles & Modern Applications. 8th ed. Upper Saddle River, New Jersey: Pearson/Prentice Hall, 2002. 528-53.
2. Vogel, “Textbook of Quantitative Chemical Analysis,” 5th Edition, ELBS, London, 1988.

3. Christian, G. D., Dasgupta, P. K., & Schug, K. A. (2014). Analytical Chemistry (7th ed.). John Wiley & Sons.

4. Squires, G. L. (2001). Practical Physics (4th ed.). Cambridge University Press. ISBN 978-0521779401.

5.https://www.researchgate.net/publication/338224715_Practical_analytical_chemistry_lab_manual_lab

6. https://www.youtube.com/watch?v=Ad7gv-7ezdU

7. https://www.youtube.com/watch?v=yIG_KRE7RKw

Internal Examination Pattern:

CAT – I : Assignments

CAT – II : PPT Presentation/ Online quiz

Mapping of POs, PSOs and COs:

COs/ POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1	3	1	2	2	-	-	1	-	3	1	2	-	3	2	1	-	-
CO2	3	-	3	2	-	-	1	-	2	1	2	-	2	1	2	-	-
CO3	3	1	3	2	1	-	2	1	2	1	3	1	3	2	3	1	1
CO4	3	1	3	3	1	-	2	1	2	1	3	1	3	2	3	1	1

Scale : 3 = High, 2 = Moderate, 1 = Low, 0 = No correlation