



# **Royal College of Arts Science and Commerce (Autonomous)**

*Affiliated to University of Mumbai*

**Program:** Batchelor of Science

**Course :** Chemistry

**Revised Syllabus for**

**Semester : I - VSC and Semester : II - SEC**

Syllabus for Undergraduate Programme as per  
National Education Policy (NEP-2020) with effect from the  
academic year 2025-2026 Progressively

## NEP Credit Structure for Science

Level	Sem	Major		Minor	OE	VSC	SEC	AEC	IKS	VEC	OJT/FP /RP/CC /CEP	Cumulative Credits	
		DSC	DSE										
4.5	I	6 (4Th + 2 Pr)		4+2 (4Th + 2 Pr)	2	2		2	2	2		22	UG Certificate Cumulative Credit:44
	II	6 (4Th + 2 Pr)		4+2 (4Th + 2 Pr)	2		2	2		2	2	22	
<b>Exit Option: Award of UG Certificate in Major with 40 -44 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor</b>													
5	III	8 (6Th + 2 Pr)		4 (2 Th + 2 Pr)	2+2		2	2			2	22	UG Diploma Cumulative Credit:88
	IV	8 (6Th + 2 Pr)		4 (2 Th + 2 Pr)	2+2		2	2			2	22	
<b>Exit Option: Award of UG Diploma in Major and Minor with 80-88 Credits and an Additional 4 Credits Core NSQF Course / Internship OR Continue with Major and Minor</b>													
5.5	V	10 (8Th + 2 Pr)	4 (2Th + 2 Pr)			4					4	22+	UG Degree Cumulative Credit:132
	VI	10 (8Th + 2 Pr)	4 (2Th + 2 Pr)			4					4	22	
<b>Total</b>		<b>48</b>	<b>8</b>	<b>20</b>	<b>12</b>	<b>10</b>	<b>6</b>	<b>8</b>	<b>2</b>	<b>4</b>	<b>14</b>	<b>132</b>	

**SEMESTER I**  
**VOCATIONAL SKILL COURSE ( VSC )**

<b>Course/ Paper Title</b>	<b>Calibration, Lab safety &amp; Solution Preparation</b>
Course offered as	Vocational Skill Course
Type	Practical
Course Code	<b>RUCHVSCP1</b>
Semester	1
No. of Credits	2
No. of Practical Hours/week	4 hour
Marks Allotted	50 Marks

Sr No.	<b>Course Objectives (CLO)</b>
CLO 1	To introduce glassware and instruments used in Chemistry laboratory
CLO 2	To understand the importance of calibration of glassware and instruments in tune with concepts of precision and accuracy.
CLO 3	To develop awareness about safety measures for handling chemicals.

	<b>Course Outcome (CO)</b>
	On completing the course, the student will be able to:
CO 1	Calibrate glassware and instruments.
CO 2	Minimize errors in chemical analysis
CO 3	use various chemicals with the necessary care.

## Semester 1 : VSC - Calibration, Lab safety & Solution Preparation

### Practicals ( RUCHVSCP1)

#### 1.1 Calibration of Laboratory Glassware

1. Calibration of Burette
2. Calibration of Pipette
3. Calibration of Standard measuring flask

#### 1.2 Calibration of Laboratory Instruments

1. Calibration of Conductometer
2. Calibration of Colorimeter
3. Calibration of pH meter
- 2.3 Quantitative estimation using oxidizing agent and MSDS of chemicals involved.  
(Minimum 2 chemicals )

#### 1.3 Chemicals and Laboratory Safety - I

1. Personal safety and safety equipments
2. Material Safety Data Sheets with reference to hazardous chemicals like  $K_2Cr_2O_7$ , Benzene, cadmium nitrate,  $\beta$ -naphthol,  $CCl_4$  and mercury.
3. Chemical storage and transfer . Precautions in handling of hazardous substances like conc. acids, ammonia, organic solvents like ether and alcohol.
4. Accidents, Hazards and First Aid

#### 1.3 Preparation of Standard Solution

1. Primary Standards ( Any 4)
2. Secondary Standards ( Any 4)

#### References-

1. Instrumental Analysis by Douglas A. Skoog, F. James Holler, Stanley R. Crouch (2006)
2. Fundamental of Analytical Chemistry by Douglas A. Skoog, West, F. James Hollers'. Crouch (2009)
3. Modern Analytical Chemistry by David Harvey, McGraw-Hill Higher Education (1999)
4. S.M. Khopkar, "Basic Concepts of Analytical Chemistry", II<sup>nd</sup> Edition New Age International Publisher (2004)
5. Principles of Instrumental Analysis, D. A. Skoog, F. James Holler, Stanley R. Crouch (2007)
6. Vogel's Textbook of quantitative chemical analysis, 5<sup>th</sup> edition (1989)
7. Instrumental method of analysis, B.K. Sharma, Goel publishing house. Miscellaneous methods (2005)

**SEMESTER 2**  
**SKILL ENHANCEMENT COURSE ( SEC)**

<b>Course/ Paper Title</b>	<b>Basic Statistical Tools in Chemistry</b>
Course offered as	Skill Enhancement Course
Type	Practical
Course Code	<b>RUSCHSECP1</b>
Semester	2
No. of Credits	2
Hours Allotted	60 Hours
Marks Allotted	50 Marks

Sr No.	<b>Course Objectives: (RUSCHSECP1 )</b>
CLO 1	To understand the significance of data and its type
CLO 2	To learn methods to assess precision and accuracy using statistical measures
CLO 3	To gain proficiency in analyzing data dispersion using statistics

	<b>Course Outcome (RUSCHSECP1 )</b>
	On completing the course, the student will be able to:
CO 1	Critically evaluate and categorize different types of data sets , distinguishing between them
CO 2	Proficiency in utilizing various measures of precision and accuracy to analyze and interpret data
CO 3	Competence in assessing data dispersion and variability through the application of statistical measures

## Semester II : Basic Statistical Tools in Chemistry - ( RUSCHSECP1)

### Practicals

- 1) To standardize the given acid solution using standard solution of NaOH. Determine mean, median and mode of titre values of acid-base titration (Minimum number titre values = 10)
- 2) To Standardise EDTA solution using 0.02M ZnSO<sub>4</sub> solution. Determine the standard deviation and variance of titre values. (Minimum number titre values = 10)
- 3) Determination of acetic acid in vinegar by potentiometry and calculate absolute and relative error
- 4) Determination of Absolute deviation, average deviation and relative average deviation from the given data of any experiments of Chemistry.
- 5) Determination of absolute and relative error in standardization of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> by using 0.05N K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>. (The readings of all students of the batch shall be used for calculation and also expert reading shall be provided)
- 6) Determine amount of Fe<sup>+2</sup> in the given solution using 1,10 - phenanthroline by colorimetry. Calculate Absolute deviation, average deviation and relative average deviation from the experimental data. (Minimum 10 values)
- 7) Prepare a buffer solution of pH 4.0 and calculate i) the absolute error and the relative error for the value obtained. ( set of 6).  
ii) Calculate the standard deviation , variance and coefficient of variation for the set of observation (set of 6).

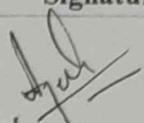
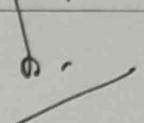
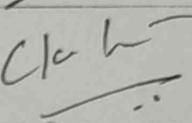
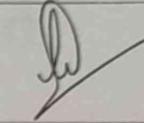
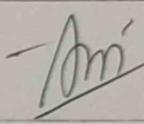
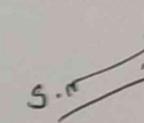
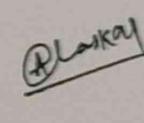
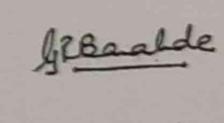
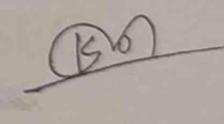
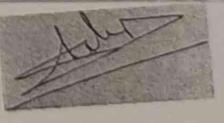
## References

1. Analytical Chemistry by Cary D. Christian, John Wiley and sons
2. Basic concepts of Analytical Chemistry by S.M. Khopkar, New Age International Publishers
3. Vogel's Textbook of Quantitative Chemical Analysis by J. Menham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th Edn, Low Price Edition, Pearson Education Ltd, New Delhi (2000)

**Evaluation Pattern for  
Major Practical Course / VSC/ SEC**

Duration for End semester examination	External Assessment for Practical	50 Marks
3 hours	Experiment	30
	Viva	10
	Journal	10

### Board of studies in Chemistry

	Category	Name and Designation	Affiliation	Signature
1	Chairperson (Head of Department)	Dr. Aqeela A. S. Qureshi, Associate Professor	Royal College of Arts, Science and Commerce. Mira Road	
2	Internal BOS Members	Prof. Kalpana Patankar Jain. Principal	Royal College of Arts, Science and Commerce. Mira Road	
		Dr. Chitrlekha Kotian Associate Professor		
		Dr. Gunwanti Negi Sinwal Assistant Professor		
		Dr. Vibha Bhagat Assistant Professor		
		Dr. Mustaqeem Mohammed - Assistant Professor		
3	External Subject Expert	Prof. Atul Chaska - Professor	Institute of Chemical Technology, Matunga , Mumbai.	
		Prof. Gayatri Barabde - Professor	<b>The Institute of Science, Mumbai</b> [Dr. Homi Bhabha State University (HBSU)]	
4	Vice-Chancellor Nominee	Prof. Krishnakant T. Waghmode	Ruparel College of Arts, Science & Commerce,	
5	Industry Representative	Shailesh G. Poojary - Chief Manager, Parle Quality Systems, Parle Products	Parle Products VS Khandekar Marg, Vile Parle East Mumbai-400057	
6	Postgraduate meritorious alumnus	Ms. Pratima Rajesh Yadav PhD. Scholar from ICT, Mumbai.	Institute of Chemical Technology , , Nathalal Parekh Marg, Matunga, Mumbai - 400019	