



Royal College of Arts Science and Commerce (Autonomous)

Affiliated to University of Mumbai

Program: Bachelor 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



Principal

**ROYAL COLLEGE OF ARTS
SCIENCE & COMMERCE
PENKAR PADA, MIRA ROAD,
DIST : THANE. PIN : 401107.**



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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	
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													
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	
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													
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	
Total		48	8	20	12	10	6	8	2	4	14	132	

SEMESTER I
VOCATIONAL SKILL COURSE (VSC)

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

Sr No.	Course Objectives (CLO)
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.

	Course Outcome (CO)
	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, β -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", IInd 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, 5th edition (1989)
7. Instrumental method of analysis, B.K. Sharma, Goel publishing house. Miscellaneous methods (2005)

SEMESTER 2
SKILL ENHANCEMENT COURSE (SEC)

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

Sr No.	Course Objectives: (RUSCHSECP1)
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

	Course Outcome (RUSCHSECP1)
	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 ZnSO₄ 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 Na₂S₂O₃ by using 0.05N K₂Cr₂O₇. (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⁺² 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).

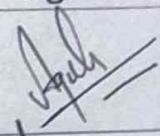

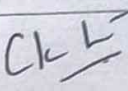
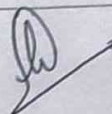
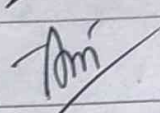
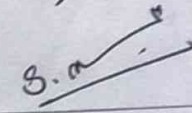
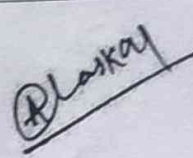
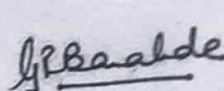
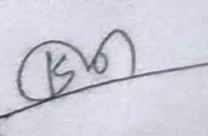

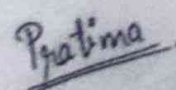
References

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 Rd	
2	Internal BOS Members	Prof. Kalpana Patankar Jain. Principal	Royal College of Arts, Science and Commerce. Mira Road	
		Dr. Chitralekha Kotian Associate Professor		
		Dr. Gunwanti Negi 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	The Institute of Science, Mumbai [Dr. Homi Bhabha State University (HBSU)]	
4	Vice-Chancellor Nominee	Prof. Krishnakant T. Waghmode	Ruparel College of Arts, Science & Commerce,	
5	Industry Representativ	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.	

Justification for B.Sc. (CHEMISTRY)

1.	Necessity for starting the course:	The necessity for starting the B.Sc. (Chemistry) course lies in its role as a foundational, interdisciplinary, and practical program that prepares students for higher education, diverse career opportunities and active participation in addressing scientific and societal challenges. The course also prepares students to contribute to solving real-world scientific and societal challenges.
2.	Whether the UGC has recommended the course:	Yes
3.	Whether all the courses have commenced from the academic year 2023-24	The course has already commenced in the university and in the academic year 25-26, it is restructured under NEP 2020
4.	The courses started by the University are self-financed, whether adequate number of eligible permanent faculties are available:	This course is aided based on sanction given by University of Mumbai to affiliated colleges time to time.
5.	To give details regarding the duration of the Course and is it possible to compress the course?	The duration of the program is three years (6 semesters). It is not possible to compress the course.
6.	The intake capacity of each course and no. of admissions given in the current academic year:	The intake capacity is 120 and no. of admission is 75 based on sections received from the University.
7.	Opportunities of Employability / Employment available after undertaking these courses:	B.Sc. (Chemistry) graduates are versatile and can adapt their skills to various industries, make them valuable assets in the workforce. Additionally, continuous learning and staying updated on industry trends can enhance career prospects and open up new opportunities.


 BoS Chairperson
 Dr. Aqeela A. S. Qureshi
 Head, Department of Chemistry
 Royal College, Mira Road




 Principal
 Prof. (Dr.) Kalpana Patankar Jain
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