



# Royal College of Arts Science and Commerce (Autonomous)

*Affiliated to University of Mumbai*

**Program: BSc/BA/BCom/BAF/BCom (Management Studies)**

**Course : O.E - Environmental Science : Chemistry Perspectives**

## Syllabus for Semester II

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



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



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## SEMESTER II

Course/ Paper Title	<b>Environmental Science : Chemistry Perspectives</b>
Course offered as	<b>Open Elective (OE)</b>
Type	Theory
Course Code	<b>RUSOECH3</b>
Semester	2
No. of Credits	2
Hours Allotted	30 Hours
No. of lecture Hours/week	2
Marks Allotted	<b>50 Marks</b>

### Course Objectives (CLO):

CLO 1	To introduce core concepts of environmental chemistry, including atoms, molecules, and chemical reactions in nature.
CLO 2	To examine the chemical composition of air, water, and soil, and the impact of pollutants on natural cycles.
CLO 3	To understand water properties, pollutants, and basic treatment methods.
CLO 4	To understand soil composition, sources of contamination, and basic remediation methods.
CLO 5	To study toxicity, industrial pollution, and the framework of environmental policies in India.
CLO 6	To foster awareness of green chemistry and sustainable energy alternatives.

### Course Outcomes (CO) :

	On completing the course, the student will be able :
CO 1	To identify key environmental chemicals and explain reactions like acid rain and photochemical smog.
CO 2	To describe carbon, nitrogen, and sulfur cycles and evaluate human impacts on these cycles
CO 3	To identify pollutants and explain basic water treatment and control.
CO 4	To recognize major soil contaminants and describe suitable remediation strategies.
CO 5	To explain routes of chemical exposure, impacts of industrial pollution, and key environmental laws.
CO 6	To apply green chemistry concepts and identify renewable energy solutions.

### O.E 3 : Environmental Science: Chemistry Perspectives

<b>Unit I</b>	<b>Basics of Environmental Chemistry :</b>
1.1	<b>Introduction to Environmental Chemistry (5 lectures)</b> <ul style="list-style-type: none"><li>• What is environmental chemistry?</li><li>• Basic chemistry concepts review (atoms, molecules, reactions)</li><li>• Importance of chemistry in understanding environmental issues : few chemical reactions in the environment , chemicals in air , water and soil and their effect on health and eco-system</li></ul>
1.2	<b>Chemical Composition of the Environment (5 lectures)</b> <ul style="list-style-type: none"><li>• Components of air, water, and soil</li><li>• Natural chemical cycles (carbon, nitrogen, sulfur)</li><li>• Human influences on these cycles</li></ul> Air Pollution Chemistry: Common air pollutants and their sources , Chemical reactions in the atmosphere (photochemical smog, acid rain)
<b>Unit II</b>	<b>Water and Soil pollution</b>
2.1	<b>Water Chemistry and Pollution (6 lectures)</b> <ul style="list-style-type: none"><li>• Properties of water and its role in the environment</li><li>• Types of water pollutants (organic, inorganic, microbial)</li><li>• Water treatment basics (filtration, sedimentation, chlorination) and pollution control</li></ul>
2.2	<b>Soil Chemistry and Contamination (4 lectures)</b> <ul style="list-style-type: none"><li>• Soil composition and chemistry (minerals, organic matters, heavy metals, pesticides from farming)</li><li>• Sources and effects of soil contaminants (pesticides, heavy metals)</li><li>• Remediation strategies (Bioremediation)</li></ul>
<b>Unit III</b>	<b>Environmental Toxicology and Green Chemistry :</b>
3.1	<b>Environmental Toxicology , Industry Perspectives and Policies (6 lectures)</b> <ul style="list-style-type: none"><li>• What is toxicity and exposure routes of harmful chemicals – inhalation, skin contact etc)</li><li>• Industry Perspectives : EPR, Climate change, Circular economy</li><li>• Environmental Policies and Laws with reference to India</li><li>•</li></ul>
3.2	<b>Sustainable Chemistry and Green Solutions (4 lectures)</b> <ul style="list-style-type: none"><li>• Principles of Green Chemistry</li><li>• Renewable energy sources ( Solar, Biogas, Wind )</li></ul>



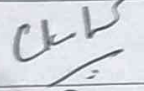
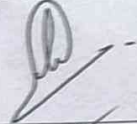
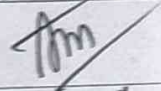

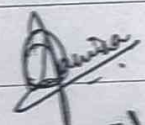
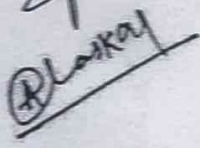
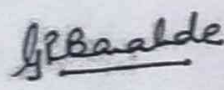
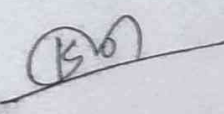

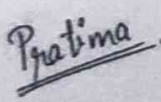
## **Reference Books:**

- 1) Environmental studies by Rajesh Yadav and Sonia Chahar, Oxford book company
- 2) Green Chemistry- Environmentally Benign Reactions by V. Ahluwalia 3<sup>rd</sup> Edition Ane Books pvt Ltd.
- 3) Environment Chemistry by Anil Kumar, New age international Limited
- 4) Environmental Chemistry by M. Satake, Y. Mido, S.A. Iqbal and M Sethi, Discovery Publisher House
- 5) Environmental Chemistry by Soumitro Ghose , Dominant Publisher and Distributors

## Examination Pattern for Open Elective


	<b>Continuous Internal Assessment</b>	Marks
a	One class test (Short answers/Objectives/ Multiple Choice)	25 (45 minutes duration )
b	Project	20
c	Attendance	05
	Total	50 marks

## 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		
		Ms. Aamina Kadari - 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 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 Matunga, Mumbai	

## 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  
 Royal College, Mira Road  
**Principal**  
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