

CURRICULUM & SYLLABUS



BACHELOR OF SCIENCE IN CHEMISTRY

OR

BACHELOR OF SCIENCE (HONS.) CHEMISTRY WITH RESEARCH/ACADEMIC PROJECTS

(A 4 Year Undergraduate Degree Program)

**Under UGC Framework - 2022 based on NEP – 2020
(w.e.f. Academic Year 2023-24)**

**DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCE AND HUMANITIES
SRM UNIVERSITY DELHI-NCR, SONEPAT
Plot No.39, Rajiv Gandhi Education City, Sonapat, Haryana-131029**

Vision

The Department of Chemistry is committed to providing intellectual, innovative, and motivational surroundings to students and faculty members. The department is focused on contributing academic, scientific, research, and experimental knowledge through excellence and producing scientists, researchers, and bureaucrats. The department wants to strive and achieve the reputation of seeking the attention of the government of India and the use of others to be invited to provide services on subjects involving chemistry and allied areas.

Mission

- To improve the problem-solving capability of students through continuous learning to produce quality Chemists, Scientists, Academic intellectuals etc. in the field of Science and Technology.
- To bridge the gap between industry and academia by imparting technical/experimental knowledge along with its application in the practical world.
- To encourage innovation through multidisciplinary research and development activities.
- To inculcate human values and ethics into students to serve the society and nation with utmost devotion.
- To develop the overall personality of students along with the learning process simultaneously.

SCIENCE GRADUATE EMPLOYABILITY ATTRIBUTES

- Sound Knowledge and Understanding of the Domain Area
- Analytical and Critical Thinking and Problem-Solving Skills
- Scientific Temperament Towards Research and Innovation for the Betterment of Society
- Efficient Communication and Presentation Skills
- Dependability, Reliability, Responsibility, and Independent Leadership Abilities

B.Sc. CHEMISTRY PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- To impart knowledge and understanding of the concepts of Organic Chemistry, Inorganic Chemistry, Physical Chemistry and related allied subjects.
- To equip students to handle apparatus and basic instrumentation used in chemistry laboratory to synthesize, isolate, and characterize molecules and materials.
- To interpret, analyze, and connect the multiple concepts of various topics through numerical, assignment, quiz, and experiment or project.
- To organize seminars, workshops, and group discussions on related topics and societal problems.
- To develop and enhance the writing, reviewing, and presentation skills of students.

B.Sc. CHEMISTRY PROGRAM LEARNING OUTCOMES (PLOs):

The students would be able to have:

- Knowledge and understanding of the fundamental concepts of Physical Chemistry, Organic Chemistry, Inorganic Chemistry, and allied subjects, along with their applications in research and industry.
- Better learning through a theoretical and evidence-based approach to explaining the chemical synthesis, analysis, and characterization of materials.
- Ability to demonstrate the basic principles of equipment and instruments.
- Ability to work both independently and in groups on complex problems to apply scientific knowledge to develop entrepreneurial abilities.
- Capacity to identify the research problem(s), plan, design, execute, and present the results and findings in a scientific manner.

MAPPING MATRIX OF PEOs & PLOs

| Programme Educational Objectives (PEO's) | Program Learning Outcomes (PLO's) | | | | |
|--|-----------------------------------|------|------|------|------|
| | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 |
| PEO1 | | | | | |
| PEO2 | | | | | |
| PEO3 | | | | | |
| PEO4 | | | | | |
| PEO5 | | | | | |

Four Year B.Sc. Chemistry Programme Structure in alignment with NEP-2020 in the Department of Chemistry, SRMUH, w.e.f. Academic Year 2023-24

| Semester | Broad Category of Courses | | | | | | | | Total Credits | Remarks |
|----------|---------------------------|-------|-------------------|------|------|------|-----------------|--|---------------|--|
| | Major | Minor | Multidisciplinary | AEC | SEC | VAC | RP/Dissertation | Live Projects/Vocational Courses/Summer Internship | | |
| I | 8 | 4 | 3 | 2 | 2 | 2 | * | | 21 | Certificate: 46 Credits |
| II | 8 | 4 | 3 | 2 | 2 | 2 | * | 4 | 25 | |
| III | 12 | 4 | 3 | 2 | 2 | * | * | | 23 | Diploma: 95 Credits |
| IV | 12 | 4 | * | 2 | 2 | 2 | * | 4 | 26 | |
| V | 16 | 8 | * | * | 2 | * | * | | 26 | Degree: 145 Credits |
| VI | 16 | 4 | * | * | * | * | * | 4 | 24 | |
| VII | 12 | 6* | * | * | * | * | 6 | | 18 | Honours / Honours with Research: 181 Credits |
| VIII | 12 | 6* | * | * | * | * | 6 | | 18 | |
| | | | | | | | | | | |
| 3 Years | 72 | 28 | 9 | 8 | 10 | 6 | 0 | 12 | 145 | |
| % | 49.66 | 19.31 | 6.21 | 5.52 | 6.90 | 4.14 | 0.00 | 8.28 | 100.00 | |
| 4 Years | 96 | 28 | 9 | 8 | 10 | 6 | 12 | 12 | 181 | |
| % | 53.04 | 15.47 | 4.97 | 4.42 | 5.52 | 3.31 | 6.63 | 6.63 | 100.00 | |
| | | | | | | | | | | |

***Students pursuing Honours will do 3 courses for 12 Credit in lieu of a Research Project/Dissertation. (2 Courses of 8 Credit in 7th Sem and 1 Course of 4 Credit in 8th Sem)**

****Students pursuing Honours with Research would complete 12 Credits of Research/Dissertation (2 Credit RM & 4 Credit Minor Project in 7th Sem and 6 Credit Major Project in 8th Sem)**

B.Sc. Chemistry - Semester-I

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|---|-------------|---|---|---|---|-----------|---------------------------------|---------|
| 1 | 23CYBS101 | Inorganic Chemistry-I (Atomic Structure and Chemical Bonding) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS102 | Physical Chemistry-I (Gaseous State and Kinetics) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS151 | Practical Inorganic Chemistry-I | 0 | 0 | 4 | 2 | Major Course Lab | |
| 4 | 23CYBS152 | Practical Physical Chemistry-I | 0 | 0 | 4 | 2 | Major Course Lab | |
| 5 | 23MD | MDC# | 3 | 0 | 0 | 3 | Multidisciplinary Course | |
| 6 | 23UAEC101 | Functional English-I | 2 | 0 | 0 | 2 | Ability Enhancement Course | |
| 7 | 23SS351 | Effective Communication Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Soft) | |
| 8 | 23TS101 | Digital Literacy & IT Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Tech) | |
| 9 | 23VAC102 | Indian Constitution & Polity | 2 | 0 | 0 | 2 | Value Added Course | |
| TOTAL | | | | | | 21 | | |
| # Multidisciplinary Course List is attached separately, and a course shall be offered only when there is sufficient number of students opt for it | | | | | | | | |

B.Sc. Chemistry - Semester-II

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|---|-------------|---|---|---|---|-----------|--|---------|
| 1 | 23CYBS201 | Organic Chemistry-I (Basic Concepts in Organic Chemistry) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS202 | Physical Chemistry-II (Solid & Liquid State and Equilibria) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS251 | Practical Organic Chemistry-I | 0 | 0 | 4 | 2 | Major Course Lab | |
| 4 | 23CYBS252 | Practical Physical Chemistry-II | 0 | 0 | 4 | 2 | Major Course Lab | |
| 5 | 23MD | MDC# | 3 | 0 | 0 | 3 | Multidisciplinary Course | |
| 6 | 23UAEC201 | Functional English-II | 2 | 0 | 0 | 2 | Ability Enhancement Course | |
| 7 | 23SS202 | Advanced Excel Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Soft) | |
| 8 | 23SS452 | Teamwork & Interpersonal Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Tech) | |
| 9 | 23VAC101 | Environment Protection & Sustainable Development | 3 | 0 | 0 | 2 | Value Added Course | |
| 10 | 23CYBS271 | Live Projects/Vocational Courses/Summer Internship | | | | 4 | Live Projects/Vocational Courses/Summer Internship | |
| TOTAL | | | | | | 25 | | |
| # Multidisciplinary Course List is attached separately, and a course shall be offered only when there is sufficient number of students opt for it | | | | | | | | |
| * Students would do Live Project/Vocational Course/Summer Internship of 4 Credits during Summer term of 6 to 8 weeks | | | | | | | | |
| On Exit, students shall be awarded UG Certificate (in Chemistry) on securing the requisite 46 Credits on completion of II-Semester. | | | | | | | | |

B.Sc. Chemistry - Semester-III

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------------|---------------|---|---|---|---|-----------|---------------------------------|-------------------|
| 1 | 23CYBS301 | Inorganic Chemistry-II (Chemistry of s and p-block Elements) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS302 | Organic Chemistry-II (Haloalkanes, Haloarenes and Oxygen Containing Functional Groups) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS351 | Practical Inorganic Chemistry-II | 0 | 0 | 4 | 2 | Major Course | |
| 4 | 23CYBS352 | Practical Organic Chemistry-II | 0 | 0 | 4 | 2 | Major Course | |
| 5 | 23CYBS303 | Introduction of Nanochemistry and its applications | 2 | 0 | 2 | 4 | Minor Stream Course | |
| 6 | 23MD | MDC-3 | 3 | 0 | 0 | 3 | Multidisciplinary Course | |
| 7 | 23UAEC301/401 | Hindi/French/German | 2 | 0 | 0 | 2 | Ability Enhancement Course | Either Sem Course |
| 8 | 23SS553 | Presentation Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Soft) | |
| 9 | 23SS303 | Statistical Analysis with SPSS | 0 | 0 | 2 | 1 | Skill Enhancement Course (Tech) | |
| TOTAL | | | | | | 23 | | |

Multidisciplinary Course List is attached separately, and a course shall be offered only when there is sufficient number of students opt for it

B.Sc. Chemistry - Semester-IV

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------------|-----------------|---|---|---|---|-----------|--|-------------------|
| 1 | 23CYBS401 | Inorganic Chemistry-III (d & f block elements and Coordination Chemistry) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS402 | Physical Chemistry-III (Phase Transition and Chemical Thermodynamics) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS451 | Practical Inorganic Chemistry-III | 0 | 0 | 4 | 2 | Major Course | |
| 4 | 23CYBS452 | Practical Physical Chemistry-III | 0 | 0 | 4 | 2 | Major Course | |
| 5 | 23CYBS403 | Analytical Methods in Chemistry | 4 | 0 | 0 | 4 | Minor Stream Course | |
| 6 | 23SS654 | Professional Skills | 0 | 0 | 2 | 1 | Skill Enhancement Course (Soft) | |
| 7 | 23SS404 | R Language Programming | 0 | 0 | 2 | 1 | Skill Enhancement Course (Tech) | |
| 8 | 23VAC103 | Sports, Yoga & Fitness | | | | 2 | Value Added Courses | |
| 9 | 23UAEC301 / 401 | Hindi/French/German | 2 | 0 | 0 | 2 | Ability Enhancement Course | Either Sem Course |
| 10 | 23CYBS471 | Live Projects/Vocational Courses/Summer Internship | | | | 4 | Live Projects/Vocational Courses/Summer Internship | |
| TOTAL | | | | | | 26 | | |

* Students would do Live Project/Vocational Course/Summer Internship of 4 Credits during Summer term of 6 to 8 weeks

On Exit, students shall be awarded **UG Diploma (in Chemistry)** on securing the requisite **95 Credits** on completion of IV-Semester.

B.Sc. Chemistry - Semester-V

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------------|-------------|---|---|---|---|-----------|---------------------------------|---------|
| 1 | 23CYBS501 | Organic Chemistry-III (Heterocyclic Chemistry, Nitrogen Containing Functional Groups and Polynuclear Hydrocarbons) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS502 | Physical Chemistry-IV (Electrochemistry, Surface Chemistry & Photochemistry) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS503 | Inorganic Chemistry-IV (Organometallics and Bioinorganic Chemistry) | 4 | 0 | 0 | 4 | Major Course | |
| 4 | 23CYBS551 | Practical Organic Chemistry-III | 0 | 0 | 4 | 2 | Major Course | |
| 5 | 23CYBS552 | Practical Physical Chemistry-IV | 0 | 0 | 4 | 2 | Major Course | |
| 6 | 23CYBS504 | Medicinal Chemistry | 2 | 0 | 2 | 4 | Minor Stream Course | |
| 7 | 23CYBS505 | Biomolecules of Life | 4 | 0 | 0 | 4 | Minor Stream Course | |
| 8 | 23AR755 | Aptitude & Reasoning | 0 | 0 | 2 | 1 | Skill Enhancement Course (Soft) | |
| 9 | 23SS505 | Programming with MATLAB | 0 | 0 | 2 | 1 | Skill Enhancement Course (Tech) | |
| TOTAL | | | | | | 26 | | |

B.Sc. Chemistry - Semester-VI

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------------|-------------|--|---|---|---|-----------|--|---------|
| 1 | 23CYBS601 | Organic Chemistry-IV (Spectroscopy and its applications) | 4 | 0 | 0 | 4 | Major Course | |
| 2 | 23CYBS602 | Physical Chemistry-V (Fundamentals of Molecular Spectroscopy) | 4 | 0 | 0 | 4 | Major Course | |
| 3 | 23CYBS603 | Fundamentals of Quantum Chemistry | 4 | 0 | 0 | 4 | Major Course | |
| 4 | 23CYBS651 | Practical Organic Chemistry-IV | 0 | 0 | 4 | 2 | Major Course | |
| 5 | 23CYBS652 | Practical Physical Chemistry-V | 0 | 0 | 4 | 2 | Major Course | |
| 6 | 23CYBS604 | Computers for Chemist | 2 | 0 | 2 | 4 | Minor Stream Course | |
| 8 | 23CYBS571 | Live Projects/Vocational Courses/Summer Internship | | | | 4 | Live Projects/Vocational Courses/Summer Internship | |
| TOTAL | | | | | | 24 | | |

*** Students would do Summer Internship of 4 Credits during Summer term of 6 to 8 weeks**

On Exit, students shall be awarded **UG Degree (in Chemistry) on securing the requisite **145 Credits** on completion of VI-Semester.**

B.Sc. Chemistry - Semester-VII

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------------|-------------|---------------------------------|---|---|---|-----------|---------------------------------|---------------------------|
| 1 | 23CYBS701 | Reagents and Chemical Processes | 3 | 0 | 1 | 4 | Major Course | |
| 2 | 23CYBS702 | Polymer and Colloidal Chemistry | 3 | 0 | 1 | 4 | Major Course | |
| 3 | 23CYBS703 | Green Chemistry | 4 | 0 | 0 | 4 | Major Course | |
| 4 | 23CYBS704 | Energy & Environment* | 2 | 0 | 0 | 2 | Minor Course* | Students pursuing Honours |
| 5 | 23CYBS705 | Research Methodology# | 2 | 0 | 0 | 2 | | Students pursuing PR |
| 6 | 23CYBS706 | Research Project | 3 | 1 | 0 | 4 | Research Project/Dissertation # | |
| TOTAL | | | | | | 18 | | |

*** Students pursuing Honours will do 1 Course of 2 Credits in lieu of Research Project in 7th Semester & 4 Credit Dissertation**

Students pursuing Honours with Research will do 6 Credits RP/Dissertation (2 Credit RM & 4 Credit Research Project)

B.Sc. Chemistry - Semester-VIII

| S. No. | Course Code | Course Title | L | T | P | Credits | Course Category | Remarks |
|--------|-------------|---|---|---|---|---------|-------------------------------|---------------------------|
| 1 | 23CYBS801 | Novel Inorganic Solids | 3 | 0 | 1 | 4 | Major Course | |
| 2 | 23CYBS802 | Metals in Medicine | 2 | 0 | 2 | 4 | Major Course | |
| 3 | 23CYBS803 | Inorganic Materials and its Industrial Importance | 3 | 0 | 1 | 4 | Major Course | |
| 4 | 23CYBS804 | Pharmaceutical Chemistry | 4 | 0 | 0 | 4 | Minor Course* | Students pursuing Honours |
| 5 | 23CYBS805 | Artificial Intelligence & Machine Learning in Chemistry | 1 | 0 | 1 | 2 | Minor Course* | Students pursuing Honours |
| 6 | 23CYBS871 | Research Project | | | | 6 | Research Project/Dissertation | Students pursuing RP |
| TOTAL | | | | | | 18 | | |

* Students pursuing Honours will do 2 Courses of 6 Credits in 8th Semester

Students pursuing Honours with Research would complete 6 Credits of Research/Dissertation in the 8th Semester

On Exit, students shall be awarded **Bachelor Degree (in Chemistry)** (Honours with Research) or (Honours) after securing the requisite **181** Credits on completion of VIII-Semester.