Bachelor of Science in Chemistry (4 Years, 240
ECTS)

A comprehensive chemistry program combining theoretical foundations with extensive laboratory experience in analytical, organic, inorganic, and physical chemistry.

Program Overview

- **Award:** B.Sc. in Chemistry
- **Duration:** 8 Semesters (4 academic years)
- **Total Credits:** 240 ECTS
- **Delivery:** Lectures (L), Tutorials (T), Laboratories (P), Studio/Project (S), Fieldwork (F)
- **Workload:** 1 ECTS ≈ 25–30 hours
- **Program Pillars:** Organic Chemistry • Inorganic Chemistry • Physical Chemistry • Analytical Chemistry • Computational Chemistry • Materials Chemistry • Environmental Chemistry • Research Methods • Safety & Ethics

Graduate Learning Outcomes

Graduates will be able to:

1. **Chemical Principles.** Apply fundamental principles of organic, inorganic, physical, and analytical chemistry to solve complex problems.
2. **Laboratory Skills.** Execute advanced synthetic, analytical, and characterization techniques with precision and safety awareness.
3. **Data Analysis.** Collect, analyze, and interpret experimental data using statistical methods and computational tools.
4. **Research Design.** Design and conduct independent research projects from hypothesis formulation to results interpretation.
5. **Chemical Safety.** Assess chemical hazards, implement safety protocols, and manage laboratory risks effectively.
6. **Communication.** Communicate chemical concepts and research findings clearly to both scientific and general audiences.
7. **Professional Development.** Demonstrate ethical behavior, teamwork skills, and lifelong learning in chemistry careers.
8. **Industry Applications.** Apply chemistry knowledge to real-world challenges in pharmaceuticals, materials, energy, and environment.

Curriculum Structure

Structured across 8 semesters (30 ECTS each). Most courses are 6 ECTS unless otherwise noted.

Year 1

Semester 1 (30 ECTS)

- General Chemistry I (Atomic Structure & Bonding) - 6 ECTS
- Mathematics for Chemists I (Calculus) - 6 ECTS
- Physics for Chemists I (Mechanics & Thermodynamics) - 6 ECTS
- Introduction to Laboratory Techniques - 6 ECTS
- Scientific Writing & Communication - 6 ECTS

Semester 2 (30 ECTS)

- General Chemistry II (Chemical Reactions & Equilibria) - 6 ECTS
- Mathematics for Chemists II (Statistics & Linear Algebra) - 6 ECTS
- Physics for Chemists II (Electricity & Magnetism) - 6 ECTS
- Quantitative Analysis Laboratory - 6 ECTS
- Chemistry Ethics & Safety - 6 ECTS

Year 2

Semester 3 (30 ECTS)

- Organic Chemistry I (Structure & Mechanisms) - 6 ECTS
- Physical Chemistry I (Thermodynamics) - 6 ECTS
- Analytical Chemistry I (Instrumental Methods) - 6 ECTS
- Organic Chemistry Laboratory I - 6 ECTS
- Technical Elective I - 6 ECTS

Semester 4 (30 ECTS)

- Organic Chemistry II (Synthesis & Reactions) - 6 ECTS
- Physical Chemistry II (Quantum Mechanics) - 6 ECTS
- Inorganic Chemistry I (Main Group Elements) - 6 ECTS
- Physical Chemistry Laboratory - 6 ECTS
- Technical Elective II - 6 ECTS

Year 3

Semester 5 (30 ECTS)

- Inorganic Chemistry II (Transition Metals & Coordination) - 6 ECTS
- Physical Chemistry III (Kinetics & Spectroscopy) - 6 ECTS
- Analytical Chemistry II (Separation Methods) - 6 ECTS
- Advanced Organic Laboratory - 6 ECTS
- Technical Elective III - 6 ECTS

Semester 6 (30 ECTS)

- Biochemistry Fundamentals - 6 ECTS
- Materials Chemistry - 6 ECTS
- Advanced Analytical Laboratory - 6 ECTS
- Technical Elective IV - 6 ECTS
- Summer Research Internship - 6 ECTS

Year 4

Semester 7 (30 ECTS)	• Advanced Inorganic Chemistry - 6 ECTS • Environmental Chemistry - 6 ECTS • Computational Chemistry - 6 ECTS • Technical Elective V - 6 ECTS • Capstone Research I (Planning & Design) - 6 ECTS
Semester 8 (30 ECTS)	• Capstone Research II (Implementation & Analysis) - 12 ECTS • Industrial Chemistry & Process Design - 6 ECTS • Chemical Entrepreneurship - 6 ECTS • Advanced Seminar & Presentation - 6 ECTS

Technical Elective Tracks

Choose at least 5 electives; focus on one track for specialization.

Track A — Pharmaceutical Chemistry

- Medicinal Chemistry
- Drug Design & Development
- Pharmacokinetics & Metabolism
- Natural Products Chemistry

Track B — Materials & Nanotechnology

- Polymer Chemistry
- Nanomaterials Synthesis
- Surface Chemistry
- Electronic Materials

Track C — Environmental & Green Chemistry

- Green Chemistry Principles
- Atmospheric Chemistry
- Water Treatment Chemistry
- Sustainable Catalysis

Track D — Analytical & Forensic

- Advanced Spectroscopy
- Forensic Chemistry
- Mass Spectrometry
- Chromatography Methods

Laboratories & Facilities

Synthesis Laboratories

Organic synthesis labs with fume hoods, glove boxes, rotary evaporators, and specialized glassware for advanced synthetic work.

Analytical Instrumentation

NMR (400 MHz), IR/UV-Vis, GC-MS, HPLC, atomic absorption, X-ray diffractometer, and mass spectrometry facilities.

Computational Resources

High-performance computing cluster with Gaussian, ChemDraw, SciFinder, and molecular modeling software packages.

Safety & Environment

Modern ventilation systems, emergency equipment, chemical storage facilities, and waste management programs.

Capstone Design Examples

- **Novel Catalyst Design for CO2 Reduction**
  Develop and test heterogeneous catalysts for converting carbon dioxide to useful chemicals and fuels.
- **Biodegradable Polymer Synthesis**
  Design and synthesize new biodegradable polymers for sustainable packaging applications.
- **Pharmaceutical Impurity Analysis**
  Develop analytical methods for detecting and quantifying impurities in pharmaceutical compounds.
- **Smart Material Development**
  Create stimuli-responsive materials with applications in sensors and drug delivery systems.