

Cendara University Course Catalog

Department of Chemistry

Academic Year 2024–2025

Undergraduate Courses (B.Sc. in Chemistry)

CHEM 101: General Chemistry I

- **Credits:** 3
- **Description:**

Introduction to chemical principles including atomic structure, bonding, stoichiometry, and periodic properties. Laboratory work emphasizes basic techniques, data analysis, and safety.

- **Prerequisites:** None
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CHEM 102: General Chemistry II

- **Credits:** 3

- **Description:**

Continuation of CHEM 101. Topics include chemical equilibria, acids and bases, thermodynamics, kinetics, and an introduction to electrochemistry. Laboratory includes quantitative analysis and experimentation.

- **Prerequisites:** CHEM 101
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CHEM 201: Organic Chemistry I

- **Credits:** 3

- **Description:**

Study of the structure, nomenclature, reactivity, and synthesis of aliphatic and aromatic hydrocarbons, alcohols, and halides. Emphasis on reaction mechanisms and stereochemistry. Laboratory explores organic synthesis and purification techniques.

- **Prerequisites:** CHEM 102
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CHEM 202: Organic Chemistry II

- **Credits:** 3

- **Description:**

A deeper exploration of organic chemistry covering carbonyl compounds, amines, biomolecules, and advanced reaction mechanisms. Laboratory components focus on multi-step syntheses, spectroscopy, and qualitative organic analysis.

- **Prerequisites:** CHEM 201

CHEM 205: Analytical Chemistry

- **Credits:** 4

- **Description:**

Comprehensive examination of quantitative chemical analysis, including gravimetric, volumetric, and instrumental methods. Laboratory experience with titrations, spectrophotometry, and chromatography.

- **Prerequisites:** CHEM 102

CHEM 210: Inorganic Chemistry I

- **Credits:** 3

- **Description:**

Fundamentals of inorganic chemistry: atomic structure, periodic trends, bonding theories, acid-base chemistry, coordination compounds. Laboratory includes synthesis and characterization of inorganic complexes.

- **Prerequisites:** CHEM 102

CHEM 301: Physical Chemistry I

- **Credits:** 3

- **Description:**

Thermodynamics, gases, phase equilibria, and properties of solutions. Laboratory incorporates experimental determination of thermodynamic properties and data analysis.

- **Prerequisites:** CHEM 205, MATH 201 (Calculus I)

CHEM 302: Physical Chemistry II

- **Credits:** 3

- **Description:**

Kinetics, quantum chemistry, molecular spectroscopy, and statistical thermodynamics. Laboratory includes experiments on reaction rates and spectroscopic measurements.

- **Prerequisites:** CHEM 301

CHEM 320: Instrumental Methods of Analysis

- **Credits:** 4

- **Description:**

Advanced techniques in chemical analysis using spectroscopy, chromatography, electrochemistry, and mass spectrometry. Hands-on laboratory training with modern analytical instruments.

- **Prerequisites:** CHEM 205

CHEM 350: Biochemistry

- **Credits:** 3

- **Description:**

Principles of biochemistry focusing on proteins, enzymes, metabolism, and nucleic acids. Laboratory component includes enzyme assays and molecular techniques.

- **Prerequisites:** CHEM 202

CHEM 401: Advanced Inorganic Chemistry

- **Credits:** 3

- **Description:**

In-depth study of transition metal chemistry, organometallics, solid-state structures, and bioinorganic processes. Students conduct advanced laboratory synthesis and characterization.

- **Prerequisites:** CHEM 210

CHEM 410: Research Methods in Chemistry

- **Credits:** 2

- **Description:**

Training in research methodology, experimental design, literature review, data interpretation, and scientific communication. Students develop an independent research proposal.

- **Prerequisites:** Junior standing in Chemistry

CHEM 495: Senior Thesis

- **Credits:** 6

- **Description:**

Capstone research project undertaken under faculty supervision. Students conduct original research, write a formal thesis, and present their findings to the department.

- **Prerequisites:** CHEM 410, Senior standing

Graduate Courses (M.Sc. in Chemistry)

CHEM 511: Advanced Organic Synthesis

- **Credits:** 4

- **Description:**

Synthesis of complex organic molecules, asymmetric catalysis, and retrosynthetic analysis. Emphasis on literature review and advanced reaction mechanisms. Laboratory involves multi-step synthetic routes and purification.

- **Prerequisites:** Admission to M.Sc. program; undergraduate Organic Chemistry

CHEM 521: Spectroscopic Methods

- **Credits:** 3

- **Description:**

Instruction in NMR, IR, MS, UV-Vis, and X-ray crystallography for structural determination. Laboratory focuses on sample preparation and data interpretation for research contexts.

- **Prerequisites:** Graduate standing

CHEM 531: Computational Chemistry

- **Credits:** 3
 - **Description:**
Methods and software for quantum chemical calculations, molecular modeling, and simulation of chemical systems. Application to molecular structure and reaction mechanism problems.
 - **Prerequisites:** Physical Chemistry (undergraduate)
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CHEM 541: Advanced Analytical Chemistry

- **Credits:** 3
 - **Description:**
Recent advances in analytical techniques, miniature sensors, environmental and clinical analysis. Laboratory includes projects using advanced instrumentation and data evaluation.
 - **Prerequisites:** Analytical Chemistry (undergraduate)
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CHEM 551: Organometallic Chemistry

- **Credits:** 3
 - **Description:**
The chemistry of metal-carbon bonds and applications in catalysis, materials, and biological systems. Includes critical reading of primary literature and a seminar component.
 - **Prerequisites:** Inorganic Chemistry (undergraduate)
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CHEM 560: Topics in Supramolecular Chemistry

- **Credits:** 2
 - **Description:**
Study of non-covalent interactions, host-guest systems, and molecular recognition. Discussion-based seminar with literature presentations and review writing.
 - **Prerequisites:** Graduate standing
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CHEM 611: Research Seminar

- **Credits:** 1
 - **Description:**
Weekly presentations by students, faculty, and visiting scholars on current research topics in chemistry. Students are required to present at least once during their program.
 - **Prerequisites:** Graduate standing
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CHEM 699: Master's Thesis Research

- **Credits:** 12 (variable)
 - **Description:**
Independent, faculty-guided research culminating in the defense of an original thesis. Students conduct experimental, theoretical, or computational research and present their findings at a departmental seminar.
 - **Prerequisites:** Completion of at least 18 credits of graduate coursework in Chemistry
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Key to Course Codes

- **CHEM 1XX, 2XX:** Introductory and foundational undergraduate courses
 - **CHEM 3XX, 4XX:** Advanced undergraduate and capstone courses
 - **CHEM 5XX, 6XX:** Graduate courses
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For further details regarding course sequencing, electives, or individualized study options, please contact the Office of the Registrar (registrar@cendara.edu) or the Department of Chemistry (chem.dept@cendara.edu).