

# CHEMISTRY

Not all courses are offered every semester. Refer to the schedule of courses for each term's specific offerings.

More Info (<http://registrar.ufl.edu/soc/>)

*Courses at the University of Florida, with the exception of specific foreign language courses and courses in the online Master of Arts in Mass Communication program, are taught in English.*

## Department Information

The Department of Chemistry is a comprehensive department granting bachelor's, master's, and Ph.D. degrees with specialization in all areas including biochemistry, nanochemistry, analytical, inorganic, organic, physical, polymer, synthetic and theoretical chemistry. The University of Florida ranks in the top five chemistry departments nationally in Ph.D. production (<http://pubs.acs.org/cen/acs/8747news1.pdf>) and is among the top 20 in bachelor's graduates.

Website (<https://www.chem.ufl.edu/>)

### CONTACT

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Map (<http://campusmap.ufl.edu/#/index/0009>)

### Curriculum

- Chemistry Minor
- Chemistry | Biochemistry

## Introduction to General Chemistry

CHM 1025, a two-credit course, is offered for students who wish to strengthen their understanding of basic concepts of atomic structure and stoichiometry before beginning the general chemistry sequence (CHM 2045/CHM 2045L, CHM 2046/CHM 2046L). A chemistry placement exam is offered online on ONE.UF (<https://one.ufl.edu/>). The score achieved determines whether CHM 1025 or CHM 2045 is the appropriate first course in chemistry.

### General Chemistry

For placement into the appropriate first course in chemistry, please refer to the Academic Advising section or consult a chemistry advisor. All students should complete their general chemistry studies without interruption.

The following general chemistry offerings are available:

- CHM 1030/CHM 1031 is a terminal sequence that meets preprofessional requirements in the College of Nursing and some majors in the College of Agricultural and Life Sciences.
- CHM 1020 is a terminal general education course that explores chemistry in terms of consumer products. This course meets preprofessional requirements in certain areas of the College of Agricultural and Life Sciences.
- CHM 2045/CHM 2045L and CHM 2046/CHM 2046L is the standard general chemistry sequence. This sequence meets the preprofessional requirement for a broad range of science

and engineering majors. Students are presumed to have a good background in high school chemistry and mathematics (through MAC 1147) and are expected to pass the chemistry placement exam offered online on ONE.UF (<https://one.ufl.edu/>) before registering for CHM 2045.

- CHM 2047/CHM 2047L is a one-semester program for entering students with strong backgrounds in chemistry, normally reflected by high AP or IB chemistry test scores. This program enables students to move more quickly into advanced work.
- CHM 2051 General Chemistry Honors is offered as an alternative to CHM 2046 for students who have done particularly well in CHM 2045.

### Attendance Requirement

Students missing the first session of a laboratory, which includes the required safety instruction, will not be allowed to start late.

## Courses

### CHM 1020 Chemistry for the Liberal Arts 3 Credits

**Grading Scheme:** Letter Grade

Provides non-science majors with a basic understanding of the substances and chemical transformations central to our lives. Introduces chemical concepts and principles help the student better understand the role and impact of modern chemistry in society. (P)

**Attributes:** General Education - Physical Science

### CHM 1025 Introduction to Chemistry 2 Credits

**Grading Scheme:** Letter Grade

Introductory readiness course in general chemistry for those with weak yet satisfactory backgrounds in high school chemistry and algebra. (P)

**Corequisite:** MAC 1147 or the equivalent.

**Attributes:** General Education - Physical Science

### CHM 1030 Basic Chemistry Concepts and Applications 1 3 Credits

**Grading Scheme:** Letter Grade

The first half of the CHM 1030/CHM 1031 sequence. A terminal sequence for non-science students that presents chemistry from a medical/nursing perspective. Topics in inorganic chemistry and properties of both ionic and covalent compounds. (P)

**Prerequisite:** high school algebra.

**Attributes:** General Education - Physical Science

### CHM 1031 Basic Chemistry Concepts and Applications 2 3 Credits

**Grading Scheme:** Letter Grade

The second half of CHM 1030/CHM 1031 sequence. Topics in organic chemistry and biochemistry. (P)

**Prerequisite:** CHM 1030.

**Attributes:** General Education - Physical Science

### CHM 2045 General Chemistry 1 3 Credits

**Grading Scheme:** Letter Grade

The first semester of the CHM 2045/CHM 2045L and CHM 2046/CHM 2046L sequence. Stoichiometry, atomic and molecular structure, the states of matter, reaction rates and equilibria. A minimum grade of C is required to progress to CHM 2046. (P)

**Prerequisite:** CHM 1025 with a minimum grade of C, or a passing score on Chem placement plus no attempt of CHM 1025 w/grade <C or W, and MAC 1147, or MAC 1140 plus MAC 1114, or higher MAC course with a minimum grade of C.

**Attributes:** General Education - Physical Science

**CHM 2045L General Chemistry 1 Laboratory 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to reflect the topics presented in CHM 2045. (P)

**Prerequisite:** CHM 1025 with a minimum grade of C, or a passing score on Chem placement plus no attempt of CHM 1025 w/grade <C or W, and MAC 1147, or MAC 1140 plus MAC 1114, or higher MAC course with a minimum grade of C.**Attributes:** General Education - Physical Science**CHM 2046 General Chemistry 2 3 Credits****Grading Scheme:** Letter Grade

The second semester of the CHM 2045/CHM 2045L and CHM 2046/CHM 2046L sequence. Students who completed CHM 2045 or equivalent at another institution should consult a chemistry advisor before registering for this course. Acids and bases, additional aspects of chemical equilibria, thermodynamics, electrochemistry, complex ions and descriptive chemistry. (P)

**Prerequisite:** CHM 2045 with a grade of C or better and [MAC 1147 or (MAC 1140 and MAC 1114)] or (MAC 2### or MAC 3### or MAC 4###).**Attributes:** General Education - Physical Science**CHM 2046L General Chemistry 2 Laboratory 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to reflect the topics presented in CHM 2046. (P)

**Prerequisite:** CHM 2045L AND (MAC 1147 or (MAC 1140 and MAC 1114) or MAC 23##) AND (CHM 2045 or CHM 2095 or CHM 2050).**Attributes:** General Education - Physical Science**CHM 2047 One-Semester General Chemistry 4 Credits****Grading Scheme:** Letter Grade

Designed for entering (not transfer) students who wish to move more quickly into advanced coursework. Electronic structure and bonding, gases, liquids, solids, kinetics, equilibria, acids and bases, thermodynamics, oxidation-reduction, metals and non-metals.

**Prerequisite:** AP, IB or high honors high school chemistry courses and a high score on the chemistry placement exam.**Corequisite:** CHM 2047L.**CHM 2047L One-Semester General Chemistry Laboratory 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to accompany CHM 2047.

**Corequisite:** CHM 2047.**CHM 2051 Honors General Chemistry 2 3 Credits****Grading Scheme:** Letter Grade

Second semester of the CHM 2045/CHM 2045L and CHM 2051/CHM 2046L sequence. Open to students with superior performance in CHM 2045 or its equivalent. Acids and bases, additional aspects of chemical equilibria, thermodynamics, electrochemistry, complex ions, descriptive chemistry and instructor-chosen topics. (P)

**Prerequisite:** CHM 2045, CHM 2045L and instructor permission.**Corequisite:** CHM 2046L.**Attributes:** General Education - Physical Science**CHM 2054L Accelerated General Chemistry Laboratory 2 Credits****Grading Scheme:** Letter Grade

A cross-disciplinary, inquiry-based curriculum that focuses on major themes and concepts in chemistry with an emphasis on their application in modern, quantitative life sciences research. Equivalent to CHM 2045L and CHM 2046L or CHM 2047L.

**Prerequisite:** CHM 2050 minimum grade of B+, or CHM 2095 minimum grade of B+, or CHM 2045 minimum grade of B+, or a score of 5 in AP Chem or 6 in IB Chem, and MAC1147, or MAC1140 plus MAC1114, or higher MAC course minimum grade of C.**CHM 2095 Chemistry for Engineers 1 3 Credits****Grading Scheme:** Letter Grade

The first semester of the CHM 2095/CHM 2096 sequence. Topics include stoichiometry, energy and thermodynamics, atomic and molecular structure, the states of matter, reaction rates and introduces chemical equilibria. All topics are taught in an engineering case-study context. (P)

**Prerequisite:** Engineering major, and CHM 1025 with a minimum grade of C, or a passing score on Chem placement plus no attempt of CHM 1025 w/grade <C or W, and MAC 1147, or MAC 1140 plus MAC 1114, or higher MAC course w/a minimum grade of C;**Corequisite:** CHM 2045L.**Attributes:** General Education - Physical Science**CHM 2095L Chemistry Lab 1 for Engineers 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to complement CHM 2095.

**CHM 2096 Chemistry for Engineers 2 3 Credits****Grading Scheme:** Letter Grade

The second course in a two-semester sequence. Topics include chemical equilibria, acid-base and solubility equilibria, entropy, free energy, electrochemical devices, solution dynamics and descriptive inorganic and organic chemistry. All topics are taught in an engineering case-study context. (P)

**Prerequisite:** CHM 2045 or CHM 2095 with a minimum grade of C.**Attributes:** General Education - Physical Science**CHM 2096L Chemistry Lab 2 for Engineers 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to complement CHM2096.

**Prerequisite:** (CHM 2045 or CHM 2095) and (CHM 2045L or CHM 2095L) with minimum grades of C and ENG college;**Corequisite:** CHM 2096.**CHM 2200 Fundamentals of Organic Chemistry 3 Credits****Grading Scheme:** Letter Grade

An elementary course embracing the more important aspects of organic chemistry. Intended for students in programs requiring only one semester of organic chemistry. Not intended for pre-med, pre-dentistry or pre-vet students.

**Prerequisite:** CHM 2046 or CHM 2047 or CHM 2051 or CHM 2096, or the equivalent.**CHM 2200L Fundamentals of Organic Chemistry Laboratory 1 Credit****Grading Scheme:** Letter Grade

Organic laboratory experiments to accompany CHM 2200.

**Corequisite:** CHM 2200.**CHM 2210 Organic Chemistry 1 3 Credits****Grading Scheme:** Letter Grade

The first half of the CHM 2210/CHM 2211 sequence intended for majors and preprofessional students. A study of the structures, syntheses and reactions of organic compounds.

**Prerequisite:** CHM 2046 or CHM 2096 or CHM 2047 or CHM 2051.

**CHM 2211 Organic Chemistry 2 3 Credits****Grading Scheme:** Letter Grade

The second half of the CHM 2210/CHM 2211 sequence intended for majors and preprofessional students. A study of the structures, syntheses and reactions of organic compounds.

**Prerequisite:** CHM 2210 or CHM 2212 with a minimum grade of C;**Corequisite:** CHM 2211L.**CHM 2211L Organic Chemistry Laboratory 2 Credits****Grading Scheme:** Letter Grade

Organic laboratory experiments designed to accompany CHM 2210/CHM 2211 or CHM 3217/CHM 3218.

**Prerequisite:** (CHM 2210 or CHM 2212 with a minimum grade of C) or CHM 3217.**CHM 2212 Organic Chemistry 1 for Majors 3 Credits****Grading Scheme:** Letter Grade

First half of the CHM 2212/CHM 2213 sequence for chemistry majors. A study of structures, synthesis, and reactions of organic compounds, with emphasis on mechanism and spectroscopy.

**Prerequisite:** (CHM 2046 or CHM 2047 or CHM 2051 or CHM 2096) and chemistry major.**CHM 2213 Organic Chemistry 2 for Majors 3 Credits****Grading Scheme:** Letter Grade

Second half of the CHM 2212/CHM 2213 sequence is for chemistry majors. Study of structures, synthesis, and reactions of organic compounds, with emphasis on mechanism and spectroscopy.

**Prerequisite:** (CHM 2210 or CHM 2212 with a minimum grade of C) and chemistry major.**Corequisite:** CHM 2211L.**CHM 3120 Introduction to Analytical Chemistry 3 Credits****Grading Scheme:** Letter Grade

Principles involved in quantitative analysis. Topics include acid-base equilibria and titrations, precipitation and complex formation, oxidation reduction and statistical treatment of data. Introduces spectrochemical and electrochemical methods of analysis and chemical separations.

**Prerequisite:** (CHM 2046 or CHM 2047 or CHM 2051) and (CHM 2046L or CHM 2047L).**CHM 3120L Analytical Chemistry Laboratory 1 Credit****Grading Scheme:** Letter Grade

Laboratory experiments designed to accompany CHM 3120.

**Corequisite:** CHM 3120 or equivalent.**CHM 3217 Organic Chemistry/Biochemistry 1 4 Credits****Grading Scheme:** Letter Grade

A rigorous, one-semester overview of the structure, properties and reactions of organic compounds. This is the first half of a two-semester sequence in biochemistry. Students are expected to take CHM 3218 after completing CHM 3217.

**Prerequisite:** (CHM 2046 or CHM 2047 or CHM 2051 or CHM 2096 or CHM 2046C) and (CHM 2046L or CHM 2047L or ISC 2401L).**CHM 3218 Organic Chemistry/Biochemistry 2 4 Credits****Grading Scheme:** Letter Grade

Introduces the basic concepts of biochemistry and molecular biology from the structural and mechanistic perspective of organic chemistry.

**Prerequisite:** CHM 3217 or CHM 2211, or instructor permission.**CHM 3400 Physical Chemistry for the Biosciences 3 Credits****Grading Scheme:** Letter Grade

Thermodynamics, electrochemistry, transport, chemical kinetics and molecular structure with emphasis on biological systems.

**Prerequisite:** (MAC 2312 or MAC 2512 or MAC 3473) and (CHM 2200 or CHM 2210 or CHM 2212), and two semesters of college physics; background in analytical chemistry recommended.**CHM 3610 Inorganic Chemistry 3 Credits****Grading Scheme:** Letter Grade

Basic theoretical concepts involved in inorganic chemistry. Periodic trends, chemical bonding, structure and reactivity.

**Prerequisite:** CHM 2211 or CHM 2213 or CHM 3217.**CHM 3610L Inorganic Chemistry Laboratory 2 Credits****Grading Scheme:** Letter Grade

Synthesis and characterization of inorganic and organometallic compounds.

**Prerequisite:** CHM 2211L and CHM 3120L, or instructor permission.**CHM 4034 Advanced Biochemistry and Chemical Biology 4 Credits****Grading Scheme:** Letter Grade

Secondary metabolism and biosynthetic pathways, bioinorganic chemistry, protein folding and trafficking, cellular signaling, replication and translation from a chemist's perspective. Applications in bioanalytical chemistry and in molecular and cell biology.

**Prerequisite:** CHM 3218 or BCH 4024.**CHM 4130 Instrumental Analysis 3 Credits****Grading Scheme:** Letter Grade

Concepts of instrumentation for chemical analysis. In-depth examination of spectrochemical and electrochemical methods and chemical separations.

**Prerequisite:** (CHM 2211 or CHM 2213 or CHM 3217) and CHM 3120 and (MAC 2312 or MAC 2512 or MAC 3473) and (PHY 2053 or PHY 2048 or PHY 2060).**Corequisite:** PHY 2054 or equivalent.**CHM 4130L Instrumental Analysis Laboratory 2 Credits****Grading Scheme:** Letter Grade

Laboratory experiments designed to accompany CHM 4130.

**Prerequisite:** (CHM 2211 or CHM 2213 or CHM 3217) and CHM 3120 and CHM 3120L and (MAC 2312 or MAC 2512 or MAC 3473) and (PHY 2053 or PHY 2048 or PHY 2060).**Corequisite:** CHM 4130**CHM 4143C Electronics and Instrumentation 3 Credits****Grading Scheme:** Letter Grade

Principles of operation of instrumentation, optimization of instrumental conditions, and interpretation of instrumental data for qualitative and quantitative analysis. Application of electronic principles necessary to code for automated electronic measurements in chemical research.

**Prerequisite:** CHM 4130, or CHM 3400 and CHM 4413L or permission of instructor.**CHM 4230 Organic Spectroscopy 2 Credits****Grading Scheme:** Letter Grade

Characterization and identification of organic compounds by spectral methods including IR, UV, NMR and mass spectrometry.

**Prerequisite:** CHM 2211 or CHM 2213 or CHM 3217

**CHM 4272 The Organic Chemistry of Polymers 2 Credits****Grading Scheme:** Letter Grade

Classification of polymerization types and mechanisms from a mechanistic/organic point of view. The structure of synthetic and natural polymers and polyelectrolytes. Reactions of polymers and practical synthetic methods of polymer preparation.

**Prerequisite:** CHM 2200, CHM 2211, CHM 2213 and CHM 3217, or the equivalent.

**CHM 4300L Laboratory in Biochemistry and Molecular Biology 2 Credits****Grading Scheme:** Letter Grade

Introduces experimental techniques in biochemistry, especially those used in DNA isolation and manipulation, protein purification and enzyme kinetic studies.

**Prerequisite:** CHM 2211L and either CHM 3218, or CHM 2211 and BCH 4024.

**CHM 4304 Chemical Aspects of Cellular Control 3 Credits****Grading Scheme:** Letter Grade

Control of information, materials and energy within cellular systems. Examples taken from the biochemistry of plants, bacteria and higher organisms.

**Prerequisite:** (CHM 3218 or CHM 2211) and BCH 4024.

**CHM 4308 Introduction to Enzyme Mechanism 3 Credits****Grading Scheme:** Letter Grade

Principles of enzyme structure, isolation and purification and principles of the physical chemistry of enzyme/substrate interactions. Overview of concepts of biological catalysis, including transition state theory, descriptions and examples of mechanisms of biochemical catalysis, survey of co-factors, and catalytic antibodies, ribozyme structure and catalysis.

**Prerequisite:** BCH 4024 or CHM 3218;

**Corequisite:** CHM 3400 or CHM 4411.

**CHM 4411 Physical Chemistry: Thermodynamics and Kinetics 4 Credits****Grading Scheme:** Letter Grade

Gas laws, kinetic theory, classical and statistical thermodynamics and applications to solutions, phase equilibria, chemical equilibria and electrochemistry.

**Prerequisite:** one year of general chemistry and one year of physics;

**Corequisite:** MAC 2313; background in analytical and organic chemistry recommended.

**CHM 4411L Physical Chemistry Laboratory 2 Credits****Grading Scheme:** Letter Grade

A series of laboratory experiments designed to accompany CHM 4411.

**Prerequisite:** CHM 3120L;

**Corequisite:** CHM 4411.

**CHM 4412 Physical Chemistry: Chemical Bonding and Spectroscopy 4 Credits****Grading Scheme:** Letter Grade

Introduces quantum theory, atomic and molecular structure, chemical bonding and spectra, chemical reaction rate laws and mechanisms, and statistical and collision theories of reaction rates.

**Prerequisite:** (CHM 2046 or CHM 2046C or CHM 2047 or CHM 2051 or CHM 2096) and (PHY 2049 or PHY 2054 or PHY 2061).

**Corequisite:** MAC 2313.

**CHM 4413L Biophysical Chemistry Laboratory 2 Credits****Grading Scheme:** Letter Grade

Laboratory experiments to demonstrate basic concepts of the physical chemistry of biological systems.

**Prerequisite:** CHM 2211L and CHM 3120L;

**Corequisite:** CHM 3400.

**CHM 4611 Advanced Inorganic Chemistry 3 Credits****Grading Scheme:** Letter Grade

Introduces advanced concepts of modern inorganic chemistry. Major themes include application of group theory to structure and bonding, molecular orbital treatment of reactivity, fundamental organometallic chemistry and introduces vibrational and electronic spectroscopy.

**Prerequisite:** CHM 3120 and CHM 3610;

**Corequisite:** CHM 4412.

**CHM 4671 Bioinorganic Chemistry 3 Credits****Grading Scheme:** Letter Grade

From an inorganic perspective, introduces the structure and function of a variety of metalloproteins and metalloenzymes, concentrating on systems containing transition metals. Emphasizes the role that metal ion(s) play in the function of the biomolecules.

**Prerequisite:** CHM 3610 and (CHM 3218 or BCH 4024).

**CHM 4905 Individual Problems 1-3 Credits****Grading Scheme:** Letter Grade

Double registration permitted. An assigned reading program or development of an assigned experimental problem.

**Prerequisite:** permission of faculty member supervising the work.

**CHM 4910 Undergraduate Research 0-3 Credits****Grading Scheme:** Letter Grade

Laboratory or literature investigations of chemical problems of current interest.

**Prerequisite:** permission of faculty member supervising the work.

**CHM 4930 Special Topics 1-4 Credits****Grading Scheme:** Letter Grade

Special Topics

**CHM 4940 Supervised Teaching 1-2 Credits****Grading Scheme:** Letter Grade

Supervised teaching, usually at the general chemistry level. Required is a superior record at UF in the course in which the student will assist and evidence that the student's own progress will not be delayed.

**Prerequisite:** instructor permission.

**CHM 4956 Overseas Studies 1-15 Credits****Grading Scheme:** Letter Grade**IDH 3931 Interdisciplinary Junior Honors 1-3 Credits****Grading Scheme:** Letter Grade

Special topics restricted to those in the university-wide honors program. (WR)

**Attributes:** Satisfies 6000 Words of Writing Requirement

**ISC 2400L Cross-Disciplinary Laboratory 1 3 Credits****Grading Scheme:** Letter Grade

First course in a two-semester inquiry-based laboratory focusing on major themes and concepts in biology, chemistry and physics with an emphasis on their integrated applications in modern, quantitative research. Satisfies course requirements for BSC 2010L, CHM 2045L and PHY 2053L.

**Prerequisite:** high school algebra or equivalent. Degree-seeking students only.

**ISC 2401L Cross-Disciplinary Laboratory 2 3 Credits****Grading Scheme:** Letter Grade

Second course in a two-semester inquiry-based laboratory focusing on major themes and concepts in biology, chemistry and physics with an emphasis on their integrated applications in modern, quantitative research. Satisfies course requirements for BSC 2011L, CHM 2046L and PHY 2054L.

**Prerequisite:** ISC 2400L and MAC 1147 or equivalent;**Corequisite:** BSC 2010 and CHM 2045 or CHM 2047 or CHM 2095.**ISC 3523C Research Methods 3 Credits****Grading Scheme:** Letter Grade

The tools scientists use to solve scientific problems, including use of experiments to answer scientific questions, design of experiments to reduce systematic and random errors, use of statistics to interpret experimental results and deal with sampling errors, mathematical modeling of scientific phenomena and oral presentation of scientific work.

**Prerequisite:** UFTeach Step 1 and one year of college biology, chemistry or physics.