

Chemistry

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Interim Chair: Dr. Bernhard Vogler (<https://www.uah.edu/science/departments/chemistry/chemistry-faculty-staff/bernhard-vogler/>)

The Chemistry department offers the following undergraduate degrees:

- Chemistry, BS (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-basic-chemistry-concentration/>)
- Chemistry, BS - Chemical Business Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-chemical-business-concentration/>)

The Chemistry department also offer the following undergraduate degrees, certified by the American Chemical Society:

- Chemistry, BS - Biochemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-biochemistry-concentration/>)
- Chemistry, BS - Pure Chemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-pure-chemistry-concentration/>)
- Chemistry, BS - Chemical Physics Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-chemical-physics-concentration/>)
- Chemistry, BS - Environmental Chemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-environmental-chemistry-concentration/>)

Program Objectives

The mission of the Department of Chemistry is to provide high quality undergraduate and graduate education in all aspects of chemistry, with a special emphasis in materials science and biotechnology. Our goal is to educate our students in chemistry, and to provide them with life-long learning skills allowing them to adapt to an ever-changing environment. Our faculty and students strive to generate new knowledge through research and other creative activities that will benefit the residents of Huntsville, the state of Alabama, the nation, and the world.

Learning Outcomes

Graduates in Chemistry will demonstrate:

- Sound conceptual understanding of basic concepts, methods, terminology, and theories of modern chemistry
- Ability to operate a suite of modern chemical instrumentation
- Ability to effectively present chemical knowledge
- Chemistry, BS (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-basic-chemistry-concentration/>)
- Chemistry, BS - Chemical Business Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-chemical-business-concentration/>)
- Chemistry, BS - Biochemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-biochemistry-concentration/>)
- Chemistry, BS - Pure Chemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-pure-chemistry-concentration/>)
- Chemistry, BS - Chemical Physics Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-chemical-physics-concentration/>)
- Chemistry, BS - Environmental Chemistry Concentration (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-environmental-chemistry-concentration/>)

Minors in Chemistry

- Chemistry Minor (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-minor-premedical-predental-students/>)
- Chemistry Minor for Chemical Engineering Majors (<http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-minor-eng/>)

CH 101 - INTRO TO CHEMISTRY

Semester Hours: 3

Properties of solids, liquids, gases, and solutions, atomic theory and bonding, concentration concepts, and physical and chemical properties of the more common elements and their compounds. No placement examination is required. Prerequisite: MA 110 or prerequisites with concurrency MA 112 or higher and CH 105.

CH 101R - RECITATION

Semester Hours: 0

CH 105 - INTRO CHEMISTRY LAB

Semester Hour: 1

Complements the lecture material for CH 101. Laboratory fundamentals and basic chemical principles. Prerequisite with concurrency: CH 101.

CH 121 - GENERAL CHEMISTRY I

Semester Hours: 3

For science and engineering majors. Chemical properties of elements, their periodic groups, and their compounds. Reactions and stoichiometry. Nature of the chemical bond, molecular structure, thermochemistry. Properties of gases, liquids, and solids. Prerequisite: CH 101 or placement test. Prerequisites with concurrency: MA 113 or higher, and CH 125.

CH 121M - GENERAL CHEMISTRY FOR CHEMISTS

Semester Hours: 3

For Chemistry Majors and Minors. Chemical properties of elements and the Periodic Table. Reactions and stoichiometry. Nature of chemical bonds, molecular structure, thermochemistry. Properties of gases, liquids, and solids. Intro to your exciting Department and its programs. Engagement activities. Prerequisites: CH 101 or Placement. Prerequisites with concurrency: MA 113 or higher, CH 125.

CH 121R - RECITATION

Semester Hours: 0

CH 122 - GENERAL CHEMISTRY ENGINEERS

Semester Hours: 3

This course is designed as a one semester presentation of key aspects in general chemistry and is recommended for all engineering majors except chemical engineers. Covers topic on atoms and molecules: reactions and stoichiometry; gases; the periodic table; atomic structure, chemical bonding and molecular structure; materials; energy, entropy, and free energy; kinetics and equilibrium; and electrochemistry. Substitutes for CH 121 when transferred to any other curriculum.

CH 123 - GENERAL CHEMISTRY II

Semester Hours: 3

Continuation of CH 121 with in-depth study of topics listed. To be taken concurrently with CH 126. Prerequisite: CH 121 or CH 121M.

CH 123R - RECITATION

Semester Hours: 0

CH 125 - GENERAL CHEMISTRY LAB I

Semester Hour: 1

Complements the lecture material for CH 121. Includes the determination of chemical and physical properties of materials, synthesis and characterization, and introduction to spectroscopy. Prerequisite with concurrency: CH 121 or CH 121M.

CH 126 - GENERAL CHEMISTRY LAB II

Semester Hour: 1

Complements the lecture material of CH 123. Includes an introduction to qualitative and quantitative analytical techniques. Prerequisite with concurrency: CH 123.

CH 151 - GENERAL, ORGANIC, BIOCHEMISTRY

Semester Hours: 3

Explore forms and behaviors of matter, composition of atoms with inorganic, nuclear, organic and biochemical reactions. Use bonding and nonbonding interactions to predict physical and chemical properties of atoms and compounds. Apply these concepts to nomenclature, reactivity, biological activity. Prerequisite: MA 112 with concurrency Co-requisite: CH 155.

CH 155 - GENORGBIOCHEM LAB

Semester Hour: 1

Complements the lecture material for CH 151. Laboratory fundamentals and basic chemical principles. Introduction to laboratory safety, practices, equipment and principles. This will include exploration of chemical bonding, gas laws, preparation of solutions, organic and biochemical concepts such as carbohydrates, lipids, and protein synthesis. Prerequisite with concurrency: CH 151.

CH 191 - FUNDAMENTALS OF CHEMICAL RES

Semester Hour: 1

Personalized programs to introduce beginning students to undergraduate research. Introduction to laboratory research techniques. Approval of supervising faculty member and chemistry chair required. Registration utilizes last digit of course number to designate semester-hour credit.

CH 192 - FUNDAMENTALS OF CHEMICAL RES

Semester Hours: 2

Personalized programs to introduce beginning students to undergraduate research. Introduction to laboratory research techniques. Approval of supervising faculty member and chemistry chair required. Registration utilizes last digit of course number to designate semester-hour credit.

CH 193 - FUNDAMENTALS OF CHEMICAL RES

Semester Hours: 3

Personalized programs to introduce beginning students to undergraduate research. Introduction to laboratory research techniques. Approval of supervising faculty member and chemistry chair required. Registration utilizes last digit of course number to designate semester-hour credit.

CH 201 - ELEM ORGANIC CHEMISTRY

Semester Hours: 3

Survey of nomenclature, structure, functional groups, properties and reactions of organic compounds. Prerequisites: (CH 101 and 105) OR (CH 121/CH 121M and 125). Prerequisite with concurrency: CH 205.

CH 205 - ELEM ORGANIC CHEMISTRY LAB

Semester Hour: 1

Laboratory component of CH 201. Includes reactions of organic compounds and functional group modifications. Prerequisite with concurrency: CH 201. Prerequisites: (CH 101 and CH 105) or (CH 121 and CH 125).

CH 223 - QUANTITATIVE ANALYSIS

Semester Hours: 3

Introduction to quantitative analytical chemistry including instrumentation. Data treatment, ionic equilibria, elementary electrochemical, spectrochemical, gravimetric, and volumetric techniques. Prerequisite: CH 126. Prerequisite with concurrency: CH 224.

CH 224 - QUANTITATIVE ANALYSIS LAB

Semester Hour: 1

Introduction to quantitative analytical chemistry laboratory. Experiments include pH measurements, spectrochemical, gravimetric, and volumetric titrations. Prerequisite: CH 126. Prerequisite with concurrency: CH 223.

CH 301 - ELEMENTARY BIOCHEMISTRY

Semester Hours: 3

Survey of structure and function of carbohydrates, lipids, proteins and nucleic acids. Enzyme properties and functions. Major metabolic pathways, interactions, and regulation. No credit given to chemistry majors or minors. Credit in CH 361 precludes credit in CH 301. Same as BYS 301. Prerequisites: BYS 119 and BYS 120 and either CH 201 or CH 331.

CH 311L - ORGANIC CHEM I LAB/OAKWOOD

Semester Hour: 1

CH 331 - ORGANIC CHEMISTRY I

Semester Hours: 3

Lecture/Lab includes one two-hour recitation per week. Chemistry of organic compounds. Synthetic methods, theory, and reaction mechanisms. Prerequisite: CH 123.

CH 331R - ORGANIC CHEM I RECITATION

Semester Hours: 0

To be taken as a co-requisite with CH 331. Organic chemistry problem solving, including nomenclature, reactions, mechanisms, spectroscopy, and test-taking strategy.

CH 332 - ORGANIC CHEMISTRY II

Semester Hours: 3

Lecture/Lab Includes one two-hour recitation per week. Continuation of CH 331. Prerequisite: CH 331.

CH 332R - ORGANIC CHEM II RECITATION

Semester Hours: 0

To be taken as a co-requisite with CH 332. Organic chemistry problem solving, including nomenclature, reactions, mechanisms, spectroscopy, and test-taking strategy.

CH 335 - ORGANIC CHEMISTRY LAB I

Semester Hour: 1

Techniques of organic chemistry including synthesis, separation, and identification of organic compounds with use of chemical and spectroscopic methods. Prerequisite with concurrency: CH 331. Prerequisite: CH 126.

CH 336 - ORGANIC CHEMISTRY LAB II

Semester Hour: 1

Continuation of CH 335. Prerequisite: CH 335. Prerequisite with concurrency: CH 332.

CH 337 - ORGANIC CHEMISTRY LAB III

Semester Hours: 2

Advanced organic chemistry laboratory treating reactions and techniques not covered in CH 335 and 336. Pursuit of a special open-ended problem by each student. Prerequisite: CH 336 and approval of instructor.

CH 341 - PHYSICAL CHEMISTRY I

Semester Hours: 3

An introduction to physical chemistry encompassing: the kinetic theory of gases, the laws of thermodynamics, chemical equilibrium, phase equilibria, electrolyte solutions, electrochemistry and elementary theories of statistical thermodynamics. Credit in CH 341 precludes credit in CH 347. Prerequisites: CH 123, PH 112, MA 201, PH 115.

CH 342 - PHYSICAL CHEMISTRY II

Semester Hours: 3

A survey of additional fundamental concepts of physical chemistry including: chemical kinetics, quantum chemistry, atomic structure, group theory, spectroscopy (i.e. IR, Raman, NMR, EMR, etc.), and surface and colloid chemistry. Credit in 342 precludes credit in CH 348. Prerequisite: CH 341.

CH 343 - INTRO TO QUANTUM CHEM

Semester Hours: 3

Quantum mechanical treatment of atoms, molecules, and spectroscopy. Prerequisites: CH 341 and MA 238.

CH 345 - EXPERIMENTAL PHYSICAL CHEM I

Semester Hour: 1

Laboratory and computer investigation into topics covered in physical chemistry CH 341. Includes thermodynamics, chemical equilibria and electrochemistry. The lab involves report writing, data and error analysis, error propagation and linear and nonlinear regression using appropriate software. Prerequisites: CH 223 and 224. Prerequisite with concurrency: CH 341 or 347.

CH 346 - EXPERIMENTAL PHYSICAL CHEM II

Semester Hour: 1

Laboratory and computer investigations into topics covered in physical chemistry CH 342. Includes kinetics, quantum mechanics and spectroscopy. The lab involves report writing, data and error analysis, error propagation and linear and nonlinear regression using appropriate software. Prerequisite: CH 345. Prerequisite with concurrency: CH 342 or 348.

CH 347 - BIOPHYSICAL CHEMISTRY I

Semester Hours: 3

Computers for data analysis and simulations. First and second laws of thermodynamics. Free energy and equilibrium. Calorimetry. Protein stability. Binding and Interactions. Solution thermodynamics. Electrolytes. Electrochemistry. Biochemical reaction kinetics. Enzyme catalysis. Same as BYS 347. Prerequisites: CH 332, PH 112 and MA 172, PH 115.

CH 348 - BIOPHYSICAL CHEMISTRY II

Semester Hours: 3

Quantum mechanics. Statistical thermodynamics. Spectroscopy, including UV-VIS, Fluorescence. Circular dichroism, NMR. Structure determinations. Same as BYS 348. Prerequisite: CH 347.

CH 351 - PHYS CHEM IN PRACTICE

Semester Hours: 3

Fundamental concepts and principles from chemical thermodynamics and reaction dynamics in practice. States of matter; energy and entropy; thermodynamic laws; chemical and phase equilibria; mixtures; and reaction rates, kinetics, and mechanisms. Derivations and computer applications of formula. Restricted to Chemical Engineering major only. Prerequisites: ENG 101 and CH 123 and MA 201 and either PH 112 or CHE 201.

CH 361 - GENERAL BIOCHEMISTRY

Semester Hours: 3

Nomenclature, structure, function, properties, and metabolism of amino acids, carbohydrates, lipids, and nucleic acids. Enzyme function, major catabolic pathways, their interrelations and control mechanisms. Glycolysis, Citric Acid Cycle, and oxidative phosphorylation. Same as BYS 361. Prerequisites: (BYS 120, CH 332 and CH 335) or (BYS 311, CH 332 and CH 335).

CH 362 - GENERAL BIOCHEMISTRY LAB

Semester Hour: 1

Lecture/Lab One 3-hour lab a week. Practical experience in isolation, qualitative identification, and quantitative estimation of biomolecules. Same as BYS 362. Prerequisites: CH 335 and 336. Prerequisite with concurrency: CH 361.

CH 363 - GEN BIOCHEMISTRY II

Semester Hours: 3

A continuation of CH 361 to include fatty acid and amino acid oxidation, enzymatic synthesis of biomolecules, integration of metabolic processes, DNA and RNA metabolism including replication and transcription, translation and protein synthesis, and regulation of gene expression. Same as BYS 363. Prerequisite: CH 361.

CH 364 - GEN BIOCHEMISTRY LAB II

Semester Hour: 1

Experimental course illustrating the topics in CH 363. Prerequisites: CH 361 and 362. Prerequisite with concurrency: CH 363.

CH 401 - INORGANIC CHEMISTRY

Semester Hours: 3

Fundamental topics in inorganic chemistry. Atomic structure, chemical bonding, symmetry, acid-base theories, non-aqueous solvents, coordination chemistry, crystal field and ligand field theory, main group and transition metal chemistry, organometallics, catalysis, and bioinorganic chemistry. Prerequisite: CH 332.

CH 402 - INORGANIC CHEMISTRY LAB

Semester Hour: 1

Laboratory techniques of inorganic chemistry including synthesis, purification, isolation, and identification of inorganic compounds. Prerequisite with concurrency: CH 401.

CH 421 - INSTRUMENTAL ANALYSIS

Semester Hours: 4

Introduction to modern analytical instrumentation including IR, UV and atomic absorption spectrophotometers, nuclear magnetic resonance, electroanalytical equipment, and gas and liquid chromatographs. Lecture and laboratory. Prerequisite with concurrency: CH 347, or BYS 347, or CH 341. Corequisite: CH 421L.

CH 421L - INSTRUMENTAL ANALYSIS LAB

Semester Hours: 0

Complements the lecture material for CH 421. Introduction to modern analytical instrumentation including IR, UV and atomic absorption spectrophotometers, nuclear magnetic resonance, electroanalytical equipment, and gas and liquid chromatographs. Prerequisites with concurrency: CH 341 or CH 347 or BYS 347. Corequisite: CH 421.

CH 435 - CHEMICAL TOXICOLOGY

Semester Hours: 3

An introduction to the principles of chemical toxicology, including the effects of drugs, environmental pollutants, natural toxins and venoms, and other potentially hazardous chemicals, at the physiological, cellular, and molecular level. Prerequisites: CH 332 and CH 361.

CH 440 - POLYMER SYNTHESIS & CHARACTERI

Semester Hours: 3

Synthesis of commercially relevant and novel polymers. Polymer characteristics and a discussion of the structural dependence of polymer properties. Course completion and/or grade requirements for undergraduate credit will differ from those for graduate credit. Prerequisites: CH 331 and CH 332.

CH 480 - SELECTED TOPICS IN CHEM

Semester Hours: 1-3

Special offerings to students in areas of interest not covered in present curriculum. Prerequisites: senior standing and approval of instructor.

CH 491 - INTRO TO CHEMICAL RESEARCH

Semester Hour: 1

Personalized programs to round out the undergraduate curriculum of students with various goals. Registration utilizes last digit of course number to designate semester hour credit. Student normally may elect only up to 6 hours. Prerequisites: Senior standing. Approval of supervising faculty member and chemistry chair required.

CH 492 - INTRO TO CHEMICAL RESEARCH

Semester Hours: 2

Personalized programs to round out the undergraduate curriculum of students with various goals. Registration utilizes last digit of course number to designate semester hour credit. Student normally may elect only up to 6 hours. Prerequisites: Senior standing. Approval of supervising faculty member and chemistry chair required.

CH 493 - INTRO TO CHEMICAL RESEARCH

Semester Hours: 3

Personalized programs to round out the undergraduate curriculum of students with various goals. Registration utilizes last digit of course number to designate semester hour credit. Student normally may elect only up to 6 hours. Prerequisites: Senior standing. Approval of supervising faculty member and chemistry chair required.