Chemistry

203-C Materials Science Building
Telephone: 256.824.6153
Email: chem@uah.edu

Mission

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.

Academic Programs

The academic program in chemistry at the University of Alabama in Huntsville has received the approval of the American Chemical Society in recognition of its strong faculty and excellent facilities for high quality undergraduate instruction. The Chemistry Department offers courses leading to the B.S. degree with a major in chemistry and supports undergraduate programs in other disciplines.

Eleven chemistry major curricula are offered that provide preparation for:

1. graduate school in biochemistry or molecular biology, medical school, dental school, or veterinary school
2. graduate study in chemistry and/or employment as an industrial chemist
3. graduate work or employment in materials chemistry
4. graduate study combining chemistry and physics
5. preparation for graduate study in forensic chemistry or employment as a forensic scientist
6. the Alabama Class B High School Teacher's Certificate for a career in chemical education
7. preparation for a career in environmental chemistry
8. general education in chemistry suitable for pre-professional students or employment as a biochemist or clinical chemist
9. pharmacy or pharmacology programs
10. chemical business
11. basic chemistry

JUMP, Joint Undergraduate Master's Program

http://www.uah.edu/graduate/admissions/jump

This program allows students to take up to 12 credits of graduate coursework that counts towards both the undergraduate and graduate degree.

Chemistry Department JUMP Guidelines

- A maximum of 12 semester hours may count toward both the B.S. and the M.S. degrees
- A GPA of 3.4 or higher is required for JUMP consideration
- Prerequisite courses for JUMP consideration are CH 223, CH 331, CH 332

Graduate-Level Courses That May Be Used to Satisfy Both the B.S. and M.S. Degree Combined Chemistry BS./M.S.

<table>
<thead>
<tr>
<th>Physical Chemistry</th>
<th>Biochemistry</th>
<th>Inorganic Chemistry</th>
<th>Instrumental Analysis</th>
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<tbody>
<tr>
<td>CH 640</td>
<td>ADV CHEMICAL THERMODYNAMICS</td>
<td>CH 600</td>
<td>ADV INORGANIC CHEMISTRY</td>
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<td>CH 642</td>
<td>ADV CHEMICAL DYNAMICS</td>
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<td>ADV BIOPHYSICAL CHEMISTRY I</td>
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<td>CH 648</td>
<td>ADV BIOPHYSICAL CHEMISTRY II</td>
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<td>Course</td>
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<tr>
<td>CH 521</td>
<td>CHEMICAL INSTRUMENTATION</td>
<td>3-4</td>
<td></td>
</tr>
<tr>
<td>or CH 633</td>
<td>ORGANIC STRUCTURE DETERMINATN</td>
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**Chemistry Research**

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>CH 500</td>
<td>TOPICS IN CHEMISTRY</td>
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**Biology Minor**

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<th>Course</th>
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<tbody>
<tr>
<td>BYS 519</td>
<td>GENE STRUCTURE &amp; FUNCTION</td>
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<td>or BYS 543</td>
<td>MOLECULAR BIOLOGY OF THE CELL</td>
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### General Chemistry B.S.

#### Physical Chemistry

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<thead>
<tr>
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<tbody>
<tr>
<td>CH 341</td>
<td>PHYSICAL CHEMISTRY I</td>
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<tr>
<td>CH 342</td>
<td>PHYSICAL CHEMISTRY II</td>
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</tr>
<tr>
<td>CH 347</td>
<td>BIOPHYSICAL CHEMISTRY I</td>
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<tr>
<td>CH 348</td>
<td>BIOPHYSICAL CHEMISTRY II</td>
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#### Biochemistry

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<tr>
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<td>CH 362</td>
<td>GENERAL BIOCHEMISTRY LAB</td>
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#### Inorganic Chemistry

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<tr>
<td>CH 401</td>
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#### Instrumental Analysis

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<td>INSTRUMENTAL ANALYSIS</td>
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#### Chemistry Research

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<td>CH 492</td>
<td>INTRO TO CHEMICAL RESEARCH</td>
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**Biology Minor**

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### Majors in Chemistry

- Chemistry, BS - Pure Chemistry Concentration (http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-pure-chemistry-concentration)
- Chemistry, BS - Chemical Education Concentration (http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-chemical-education-concentration)
- Chemistry, BS - Pre-Professional Concentration (http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-preprofessional-concentration)
- Chemistry, BS - Pre-Pharmacy Concentration (http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-prepharmacy-concentration)
- Chemistry, BS - Basic Chemistry Concentration (http://catalog.uah.edu/undergrad/colleges-departments/science/chemistry/chemistry-bs-basic-chemistry-concentration)
Minors in Chemistry


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 prerequisite with concurrency MA 112 or higher. Prerequisite with concurrency: 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. Prerequisite with concurrency: MA 113 or higher, and 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.

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.

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 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 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 101/105 or CH 201/205.

CH 211 - ANALYTICAL CHEMISTRY/OAKWOOD
Semester Hours: 3

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 of minors. Credit in CH 361 precludes credit in CH 301. Same as BYS 301. Prerequisites: BYS 120 and either CH 201 or 331.

CH 311 - ORGANIC CHEMISTRY I/OAKWOOD
Semester Hours: 3, 4
CH 311L - ORGANIC CHEM I LAB/OAKWOOD
Semester Hour: 1

CH 312 - ORGANIC CHEMISTRY/OAKWOOD
Semester Hours: 3

CH 315 - CHEMISTRY TEACHING METHODS
Semester Hours: 3
Designed for students pursuing a Class B High School Teacher's Certificate. The course explores methods of presentation of chemical principles, including chemical demonstrations. Prerequisites: CH 201 or 223. Permission of instructor.

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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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. Prerequisites: 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.

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. Prerequisites: CH 345. Prerequisite with concurrency: CH 342 or 348.

CH 347 - BIOPHYSICAL CHEMISTRY I
Semester Hours: 3
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 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 or 201, and CH 332, 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. Prerequisites: 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. Prerequisites: 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 407 - BIOCHEMISTRY I/A&M  
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.

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.