Chemistry and Biochemistry

Department Location
Science Center, Room 343

Department Approval
The Department of Chemistry & Biochemistry offers a program that is approved by the American Chemical Society. Refer to the ACS Certification description below and the Department Handbook for more details.

Special Entry Requirements
None

Placement Examinations
Students entering with an Advanced Placement (AP) Chemistry Examination score of 4 or higher may enroll in General Chemistry 112 with departmental approval based on an assessment of previous laboratory experience equivalent to the General Chemistry 111 laboratory.

Goals
The Department of Chemistry & Biochemistry seeks to establish itself as a benchmark in the discipline, serving as a model for educating and training undergraduate students in the chemical sciences within a liberal arts context. The Department strives to create a vibrant learning community focused on promoting academic excellence, research training and scientific discovery as well as lifelong learning. The Department is united in its vision of providing the best possible learning environment for our students that develops their intellectual, ethical, social consciousness and leadership potential and produces graduates who are well prepared for graduate school, professional school, and future careers.

Objectives
A student who has successfully completed courses in the Department of Chemistry & Biochemistry will

1. be able to develop and apply critical thinking and scientific reasoning skills toward problem-solving
2. be able to develop and apply chemical techniques while engaged in scientific investigations
3. demonstrate how to thoroughly search, analyze, and apply scientific literature
4. demonstrate their scientific knowledge through effective oral and written communication

Requirements for Departmental Honors
Students graduating with honors in the Department of Chemistry & Biochemistry must have (1) a 3.0 overall GPA, (2) a 3.2 GPA in Chemistry/Biochemistry courses (excluding research and seminar), (3) research experience, including dissemination of results in writing (e.g., thesis or publication), and (4) departmental service as a lab assistant, teaching assistant (tutor), or peer mentor.

Requirements for Majors in Biochemistry, Chemistry and Dual Degree Engineering
Ten (10) lecture courses in the content area are required of all majors, not including seminar, research, and laboratory courses. Seven laboratory courses in the content area are required. Courses in the Department typically meet four hours a week with laboratory course being 1 credit hour and lecture courses being 3 to 4 credit hours per semester. Most lectures and laboratories are separate courses. Courses with laboratories are typically four total credit hours per semester.

The Department offers five chemistry options. All options require two semesters of General Chemistry with lab, two semesters of Organic Chemistry with lab, two Advanced Chemistry electives, and a Senior Undergraduate Seminar in Chemistry.

To fulfill the prerequisite requirements, the student must complete the course with a grade of a "C" or higher. Successful completion of all chemistry courses with no grade less than "C" is required for graduation as a chemistry or biochemistry major. Other required science cognate courses (physics, math, biology) must be completed with no grade less than "C."

Support (cognate) courses include a minimum of two semesters of Calculus and two semesters of Physics (with lab); additional support courses are required for Dual Degree Engineering. All chemistry majors are encouraged to take additional mathematics and physics courses, especially for students interested in graduate school in physical or analytical chemistry. Undergraduate research is strongly recommended for all chemistry majors.

Transfer or equivalent chemistry course credit will be granted only upon the approval of the Department.

Options in Biochemistry, Chemistry and Dual Degree Engineering
The five majors within the Department are described below. Students may choose one of the following sequences:

Biochemistry
This sequence is strongly recommended for students planning to pursue graduate studies in fields related to biochemistry (i.e., pharmacology, toxicology, molecular biology, etc.). The sequence is valuable also as preparation for entry into medical or dental school, or other allied health disciplines. Students planning to enter the job market directly after graduation would also benefit from the Biochemistry sequence. Required content area courses are as follows:

Lecture Courses
- CHE 111 General Chemistry I for majors
- CHE 112 General Chemistry II for majors
- CHE 231 Organic Chemistry I for majors
- CHE 232 Organic Chemistry II for majors
- CHE 301 Analytical or CHE 496 – Instrumental Analysis
- CHE 311 Biochemistry I
- CHE 312 Biochemistry II
- CHE 345 Physical Chemistry I
- CHE 346 Physical Chemistry II
- CHE 446 Advance Biochemistry (CHE 446)

Lab Courses
- CHE 111L General Chemistry I Lab for majors
- CHE 112L General Chemistry II Lab for majors
- CHE 233 Organic Chemistry I Lab
- CHE 234 Organic Chemistry II Lab
- CHE 301L Analytical Lab
- CHE 313L Biochemistry Lab
- CHE 346L Physical Chemistry II Lab

In additions, students are required to take Undergraduate Senior Seminar in Chemistry (CHE 429) and two semesters of undergraduate research. Total hours required in chemistry are 43. Other required science cognate courses are Organismal Form and Function (BIO 115); Biology of the Cell (BIO 120); Physics I and II (PHY 151, 241); Calculus I and II (MATH 231, 232); Computer Science I – C++ (CIS121), and one semester of a biology or mathematics elective chosen from the approved departmental list.

Chemistry Option 1
This sequence is recommended for students seeking entry into graduate school in fields related to chemistry (i.e., nanotechnology, cosmetics, polymer chemistry, etc). Students planning to enter the job market directly after graduation would also benefit from the Option 1 sequence. Required content area courses are as follows:

Lecture Courses
- CHE 111 General Chemistry I for majors
- CHE 112 General Chemistry II for majors
- CHE 231 Organic Chemistry I for majors
- CHE 232 Organic Chemistry II for majors
- CHE 410 Biochemical Principals, CHE 311 Biochemistry I, or BIO 470 Biological Chemistry
- CHE 421 Inorganic Chemistry
- CHE 496 Instrumental Analysis
- CHE 345 Physical Chemistry I
- CHE 346 Physical Chemistry II

Lab Courses
- CHE 111L General Chemistry I Lab for majors
- CHE 112L General Chemistry II Lab for majors
- CHE 233 Organic Chemistry I Lab
- CHE 234 Organic Chemistry II Lab
- CHE 421L Inorganic Chemistry Lab
- CHE 346L Physical Chemistry II Lab

In additions, students are required to take an additional chemistry elective with lab (for non-ACS certification only), advanced chemistry elective with lab (for ACS certification only), and Undergraduate Senior Seminar in Chemistry (CHE 429). Total minimum hours required in this option are 43. Other required science cognate courses are Computer Science I – C++ (CIS 121), Physics I and II (PHY 151, 241), and Calculus I and II (MAT 231, 232); Differential Equations (MAT 365) and Physics III (PHY 242) are recommended courses.

Chemistry Option 2
This sequence is recommended for students who plan to enter professional degree programs in medicine, dentistry or allied health fields, or seek entry to post-baccalaureate or graduate programs that require science degrees for admission. Students planning to enter the job market directly after graduation would also benefit from the Option 2 sequence.

Lecture Courses
- CHE 111 General Chemistry I for majors
- CHE 112 General Chemistry II for majors
- CHE 231 Organic Chemistry I for majors
- CHE 232 Organic Chemistry II for majors
- CHE 301 Analytical
- CHE 345 Physical Chemistry I

Lab Courses
- CHE 111L General Chemistry I Lab for majors
- CHE 112L General Chemistry II Lab for majors
- CHE 233 Organic Chemistry I Lab
- CHE 234 Organic Chemistry II Lab
- CHE 301L Analytical Lab

In additions, students are required to take four additional advance chemistry lectures, two additional advance chemistry labs (one regular elective and one advance elective), and Undergraduate Senior Seminar in Chemistry (CHE 429). Electives must be selected from the approved departmental list. Total hours required in this option are 41. Other science core courses required are Calculus I and II (MAT 231, 232); Physics I and II (PHY 151, 241); Biochemistry I and II, with lab (CHEM 311, 312, 313L); Organismal Form and Function (BIO 115); Biology of the Cell (BIO 120); and one semester of a biology elective is recommended for students who plan to enter professional and allied health programs.

Chemistry, Teaching Certification in Secondary Education
This sequence is recommended for students planning to enter the teaching profession with a certification in secondary education. The required content area lecture courses are

Lecture Courses
- CHE 111 General Chemistry I for majors
- CHE 112 General Chemistry II for majors
- CHE 231 Organic Chemistry I for majors
- CHE 232 Organic Chemistry II for majors
- CHE 301 Analytical
- CHE 345 Physical Chemistry I
- CHE 410 Biochemical Principals, CHE 311 Biochemistry I, or BIO 470 Biological Chemistry
- CHE 421 Inorganic Chemistry

Lab Courses
- CHE 111L General Chemistry I Lab for majors
- CHE 112L General Chemistry II Lab for majors
- CHE 233 Organic Chemistry I Lab
- CHE 234 Organic Chemistry II Lab
- CHE 301L Analytical Lab
- CHE 421L Inorganic Chemistry Lab

In additions, students are required to take one additional chemistry lecture, one additional chemistry lab, and Undergraduate Senior Seminar in Chemistry (CHE 429). Other science cognate courses are Introduction to Environmental Science (ES 211), Calculus I and II (MATH 231, 232) and Physics I and II (PHY 151, 241).

Dual Degree Engineering

A student enrolled in the Dual Degree Engineering program may earn a joint B.S. degree with a major in chemistry and a Bachelor of Science in an engineering field such as Chemical Engineering, Biomolecular Engineering, or Environmental Engineering. The required content area lecture courses are:

Lecture Courses
- CHE 111 General Chemistry I for majors
- CHE 112 General Chemistry II for majors
- CHE 231 Organic Chemistry I for majors
- CHE 232 Organic Chemistry II for majors
- CHE 345 Physical Chemistry I
- CHE 346 Physical Chemistry II
- CHE 410 Biochemical Principals, CHE 311 Biochemistry I, or BIO 470 Biological Chemistry
- CHE 421 Inorganic Chemistry
- CHE 496 Instrumental Analysis

Lab Courses
- CHE 111L General Chemistry I Lab for majors
- CHE 112L General Chemistry II Lab for majors
- CHE 233 Organic Chemistry I Lab
- CHE 234 Organic Chemistry II Lab
- CHE 421L Inorganic Chemistry Lab

Total hours required in this option are 33. Six additional hours approved by the Department are required at 3000–4000-level chemistry-related engineering courses at Georgia Institute of Technology or equivalent courses at another participating dual degree engineering school. Other science courses required are Physics I, II, and III (PHY 151, 241, 242 – depending on requirements of the engineering institution); Calculus I, II, and III (MATH 231, 232, 324). One semester of an advanced mathematics elective is required, either Applied Math or Linear Algebra (MATH 367 or 214).

ACS Certification

Students majoring in chemistry majors may obtain ACS certification. An ACS certified degree in chemistry is a valuable credential that provides national-level recognition for successfully completing a rigorous chemistry curriculum. In order to receive ACS certification, majors will have to complete the following courses: CHE 111, 111L, 112, 112L; Five Foundation Courses – CHE 231; 301; 311 or 410; 345; 421; Four In-Depth Courses as selected from – 232 (required), 312, 346, 356, 411, 446, 452, 453, 496 or advanced courses offered within the AUC; Laboratory Experience – 400 hours of lab experience beyond the General Chemistry labs with lab work covering at least four of the five foundation areas. (NOTE: Up to 180 lab hours and 4 credit hours of in-depth coursework can be accounted for in research lab courses and must culminate in a comprehensive, well-documented research report or thesis, including safety considerations.)

Major Cognate Courses

PHY 151, 241; MATH 231, 232 for all tracks. BIO 115, 120 are required for biochemistry majors and recommended for students who plan to enter professional health and allied health programs.

Requirements for Minors in Biochemistry and Chemistry

The Chemistry Department also offers minors in biochemistry and chemistry.

1. Biochemistry Minor

The minor consists of 26 hours. The courses required are
1. General Chemistry 111, 112, 111L, 112L (two semesters, with laboratory);
2. Organic Chemistry 231, 232, 233L, 234L (two semesters, with laboratory); and
3. Biochemistry 311, 312, 313L (two semesters, with one semester of laboratory).

2. Chemistry Minor

The minor in Chemistry consists of 25 hours. The courses required are
1. CHE 111, 112, 111L, 112L General Chemistry (two semesters, with laboratory);
2. CHE 231, 232, 233L, 234L Organic Chemistry (two semesters, with laboratory);
3. CHE 345 Physical Chemistry (first semester, no lab); and,
4. Advanced Chemistry Elective (one semester, with its corresponding laboratory). Possible courses: CHE 301, 301L Analytical Chemistry, CHE 311, 313L Biochemistry, CHE 421, 421L Inorganic Chemistry, or CHE 496, 496L Instrumental Analysis.

All Chemistry core courses must be taken initially at Spelman College. Students may repeat one lower level core course (100-200 level) and repeat one upper level core course (300-400) at another institution. Successful completion of these courses with no grade less than "C" is required for graduation as a biochemistry or chemistry minor.

Course Descriptions

CHE 111 – GENERAL CHEMISTRY I (3)

As the first course in the General Chemistry sequence for science majors, CHE 111 will introduce students to the basic principles of modern chemistry. The students will learn methods of scientific experimentation that will lead to the development of chemical principles used in practical problem-solving. Topics to be covered include measurement, atomic the-

ory, nomenclature, stoichiometry, chemical reactions, gas laws, thermochemistry, electronic structure, periodic properties, and an introduction to chemical bonding. Corequisite: MATH 115; CHE 111L,R. Lecture four hours per week.

CHE 111L – GENERAL CHEMISTRY I LABORATORY (1)
The General Chemistry 111 laboratory course is the first semester lab course in the general chemistry sequence and is to be taken concurrently with the General Chemistry 111 lecture course. Experiments to be performed, based on the topics discussed in lecture, include basic lab techniques, physical properties, chemical formula determination, percent yield, gravimetric analysis, gas behavior, reactions in aqueous solutions, heat of neutralization and atomic spectroscopy. Corequisites: CHE 111 ; MATH 115. Laboratory three hours per week.

CHE 112 – GENERAL CHEMISTRY II (3)
In the second course in the General Chemistry sequence for science majors, the development of chemical principles will be discussed involving topics in chemical bonding, properties of solids, liquids and solutions, chemical kinetics, acid-base theory, aqueous equilibria, thermodynamics and electrochemistry. Prerequisite: CHE 111, 111L; MATH 115. Lecture four hours per week.

CHE 112L – GENERAL CHEMISTRY II LABORATORY (1)
The General Chemistry 112 laboratory course is the second semester lab course in the general chemistry sequence and is to be taken concurrently with the General Chemistry 112 lecture course. Experiments to be performed, based on the topics discussed in lecture, include molecular geometry, vapor pressure, colligative properties, rate of reaction, equilibrium constant determination, acid-base titrations, buffers, and qualitative analysis. Prerequisites: CHE 111, 111L; Corequisite: CHE 112. Laboratory three hours per week.

CHE 152 – MOLECULES OF LIFE (4)
Intended for the non-natural science major, this course explores the modern science of biological molecules, which exists at the intersection of chemistry, biology and medicine. The major molecular components of living cells are examined with emphasis on the role played by chemical principles in understanding the structure and function of these components. Students will develop the molecular insights necessary to understand how drugs work and how pharmaceutical treatments are designed. Lecture three hours per week; laboratory two hours per week.

CHE 159 – FOOD CHEMISTRY (4)
To fulfill the natural science requirement for non-majors, this four-credit hour course explores the chemistry of food and the cooking process from a scientific basis. Each week students will create an edible experiment and look at the science behind how it all works. Experimental and hands-on approaches will illustrate the chemical, biochemical and physical principles of chemistry, including extraction, denaturation, and phase changes. Lecture two hours per week. Laboratory two hours per week.

CHE 231 – ORGANIC CHEMISTRY I (4)
This is the first course in a two-semester sequence. The course focuses on the principles of structure, bonding, and properties and their connection to conformations, stereochemistry, and reactions of organic molecules. Molecular classes covered are alkanes, alkenes, alkynes, alkyl halides, alcohols, and aromatic compounds. The lecture periods are designed for the discussion of these concepts; to provide the student an opportunity to ask questions; and to teach problem-solving techniques. Prerequisite: CHE 112, 112L. Lecture four hours per week.

CHE 232 – ORGANIC CHEMISTRY II (4)
This course is a continuation of Chem 231 (and the second course of the Organic Chemistry sequence) with an emphasis on structure and reactivity, mechanisms, synthesis of complex organic molecules and characterization using spectroscopic techniques. Lecture topics include carbonyl compounds (aldehydes, ketones, carboxylic acids and carboxylic acid derivatives), amines, and more complex molecules including polymers, biomolecules (carbohydrates, lipids, amino acids, proteins and nucleic acids) and organometallic compounds. Prerequisite: CHE 231. Lecture four hours per week.

CHE 233L, 233R – ORGANIC CHEMISTRY I LABORATORY AND RECITATION (1, 0)
A one-semester laboratory course in basic experimental techniques, stereochemistry, and reaction pathways. Isolation, purification, and compound characterization are emphasized. Corequisite or Prerequisite: CHE 231. Laboratory and recitation discussion five hours per week.

CHE 234L, 234R – ORGANIC CHEMISTRY II LABORATORY AND RECITATION (1, 0)
A one-semester laboratory course engaging students in the use of the chemical literature and experimentation in reaction kinetics, multistep synthesis, advanced qualitative analysis, and spectroscopy. Prerequisite: CHE 233L; Corequisite or prerequisite: CHE 232. Laboratory and recitation discussion five hours per week.

CHE 301, 301L – ANALYTICAL CHEMISTRY (3,1)
This course focuses on the fundamental principles of analytical chemistry. Topics include errors and uncertainty in quantitative analysis, statistics, chemical equilibrium, titrimetric methods, electrochemistry, spectroscopy and chromatography. Prerequisite: CHE 112, 112L. Prerequisite: CHE 112, 112L. Lecture three hours per week. Laboratory four hours per week.

CHE 311 – BIOCHEMISTRY I (4)
The first of a two-semester course sequence in Biochemistry, this course will focus on the structure and function of the five major classes of biomolecules or cellular components (water, amino acids and proteins, nucleotides and nucleic acids, sugars and polysaccharides, and fatty acids and lipids) with an emphasis on the roles of water and buffer systems, enzyme kinetics, genomics, membrane transport and biosignaling. Prerequisite: BIO 115 and 120; CHE 232, 233L. Corequisites: 234L, 313L. Lecture four hours per week.

CHE 312 – BIOCHEMISTRY II (3)
The second of a two-semester course sequence in Biochemistry, this course will focus on the bioenergetics of metabolism. Degradative and biosynthetic pathways of biomolecules, including their regulation and integration, will be included. Information pathways regarding gene expression, nucleic acid metabolism, as well as prokaryotic and eukaryotic protein synthesis, will be covered. Prerequisites: CHE 311. Lecture three hours per week.

CHE 313L – BIOCHEMISTRY LABORATORY (1)
This course will acquaint students with the techniques and instrumentation essential for conducting biochemical experimentation with an emphasis on quantitative concepts. Included are experiments employing UV/Visible spectrophotometry, determination of protein and glucose concentrations, enzyme kinetics parameters, chromatography, protein isolation and purification skills, electrophoresis, immunoblotting, and microarray techniques. Corequisite: Either CHE 311, CHE 410, or CHE 312. Laboratory four hours per week.

CHE 345 – PHYSICAL CHEMISTRY I (3)
The first semester of a two-semester sequence in physical chemistry, this course covers fundamental concepts of chemical kinetics, chemical thermodynamics, and quantum mechanics. Prerequisite: CHE 232; MATH 232, PHY 151. Corequisite: PHY 241. Lecture and interactive discussion three hours per week.

CHE 346 – PHYSICAL CHEMISTRY II (3)
The second part of a two semester sequence in physical chemistry, this course covers in-depth topics in chemical kinetics, chemical thermodynamics and quantum chemistry. Several spectroscopic techniques will be discussed. Statistical thermodynamics will be introduced. Prerequisite: CHE 345. Lecture and interactive discussion three hours per week.

CHE 346L – PHYSICAL CHEMISTRY LABORATORY (1)
This one-semester laboratory course covers basic physical chemistry laboratory techniques, including chemical thermodynamics, chemical kinetics and molecular properties using various analytical, spectroscopic, and computational chemistry techniques. Computer data analysis used. Prerequisite: CHE 345. Corequisite: CHE 346. Laboratory four hours per week.

CHE/PHY 356 – LASERS, OPTICS AND SPECTROSCOPY (4)
A laboratory-based, in-depth study of the applications of lasers in Physics and Chemistry emphasizes the scientific method. Areas covered include optics, light, light-matter interaction, lasers, spectroscopy and applications of mathematics in Chemistry and Physics. Prerequisite: MATH 232, and either PHY 261 or CHE 346; or permission of the instructor. Six hours of lecture and laboratory per week.

CHE 410 – PRINCIPLES OF BIOCHEMISTRY (3)
The chemistry of biological systems comprises the discipline of Biochemistry. The major classes of biomolecules and their corresponding macromolecules are emphasized both in structure and in function. The roles of enzyme catalysts, thermodynamic considerations, and the interrelationship of metabolic pathways complete the content of the material. This course is required for Option 1 majors seeking ACS certification. Prerequisite: CHE 345. Lecture three hours per week.

CHE/ES 411 – TOXICOLOGY (4)
This course will focus on the chemistry and biochemistry of toxic substances, including their detection, mechanism of action, and effects on the body. Classes of toxicants and the enzyme systems by which they are metabolized will be discussed, distinguishing between detoxification and bioactivation. This course serves as an upper division College Honors Program elective and requires an oral and written presentation on a chosen toxicant. Prerequisites: BIO 115 &120, CHE 232. Lecture and discussion four hours per week.

CHE 421, 421L – INORGANIC CHEMISTRY (3,1)
This course provides a descriptive and quantum chemical examination of the structure, properties, bonding and chemical reactivity of inorganic compounds, with emphasis on transition metal coordination, organometallic and bioinorganic complexes. Prerequisite: CHE 232 (all majors), CHE 346 (Option 1, Option 2, Secondary Education seniors); Corequisite: CHE 345 (Dual Degree Engineering juniors only). Lecture three hours per week; Laboratory four hours per week.

CHE 429 – UNDERGRADUATE SEMINAR IN CHEMISTRY (1)
This capstone course requires the student to prepare a scientific research proposal, which is at the core of the scientific process. The process involves formulation of a hypothesis, discussion of the scope and significance of the scientific problem, and an outline of the research plan. This course provides a unique opportunity to combine the knowledge acquired in previous chemistry courses with the critical thinking skills essential in solving scientific problems. Prerequisite: CHE 232, 234L. Corequisite: CHE 345. Class meets one hour per week.

CHE 431, 432, 433, 434 – UNDERGRADUATE RESEARCH IN CHEMISTRY (0-3)
This course requires research on a problem of current interest, under the supervision of a faculty member; two credit hours are required for biochemistry majors. Other interested majors also encouraged to participate. One credit hour equals three in-lab contact hours. Prerequisite: CHE 232, 234L, and departmental approval.

CHE 441 – MEDICINAL CHEMISTRY (3)
Medicinal Chemistry is the study of the structure, design and biological significance of existing and novel drugs. The course will explore the relationship between a chemical structure and its physiochemical characteristics and biological activity that explain how drugs act and why. This research-based course consists of both lectures and computational laboratory components that introduce students to computer-aided drug design (CADD) applications. Prerequisites: CIS 100, CHE 232/234L

CHE 446 – ADVANCED BIOCHEMISTRY (3)
This course will focus on special topics in advanced Biochemistry, including enzyme kinetics of bi-substrate systems, structure and mechanisms of action of hormones, glycoconjugate structure and function, biosynthesis of heme, chemistry of blood clotting, eukaryotic protein synthesis, and innate and humoral immune responses. Written analysis of a current, refereed Biochemical literature article is required. Prerequisite: CHE 312. Corequisite: CHE 345. Lecture three hours per week.

CHE 452 – CHEMISTRY OF NATURAL PRODUCTS (3)
This is a one semester condensed advanced course in organic chemistry. This course has been crafted to familiarize students with the recent advances in isolation techniques, structure determination, synthetic methods of reaction mechanisms, biosynthesis, physico-chemical measurements and new concepts in the realm of organic natural products. This course, being interdisciplinary in nature, encourages students to pursue advanced studies in biology, biochemistry, pharmacology, medicine, biophysics, and biotechnology. Prerequisite: CHE 232. Lecture and discussion three hours per week.

CHE/ES 453 – ENVIRONMENTAL CHEMISTRY (3)
This course will expose students to concepts in environmental chemistry as it relates to the sources, reactions, transport effects, and fate of chemical species in water, soil and air. In addition, through reading assignments, problem-solving and group projects, students will learn the use of the technology and its impact on the environment. Prerequisite: CHE 232. Lecture and discussion three hours per week.

CHE 496 – INSTRUMENTAL ANALYSIS (4,0)
A course in the theory and techniques of modern chemical instrumentation, it emphasizes spectroscopy and chromatography. Prerequisite: CHE 345, MATH 232, and PHY 241. Lecture and discussion three hours per week. Laboratory four hours per week.

Advanced Chemistry Courses Offered at Other AUC Schools

CHE 421 – Advanced Inorganic Chemistry (Morehouse, 4)
This course provides a rigorous treatment of the chemistry of inorganic compounds, including structure, properties and reactions, and their interpretation in terms of quantum chemistry and group theory. Prerequisite: CHE 322/322L. Lecture, 3 hours per week. Laboratory and lab lecture, 6 hours per week.

CHE 422 – Chemical Instrumentation (Morehouse, 4)
This course provides chemical analysis based on the use of modern instruments. Emphasis is placed on quantitative analysis of materials using spectroscopic, electrochemical, magnetic and chromatographic techniques. Prerequisite: CHE 322/322L. Lecture, 3 hours per week. Laboratory and lab lecture, 6 hours per week.

CHE 423, 424 – Advanced Physical Chemistry (Morehouse; 3,3)
This course covers theoretical principles of modern physical chemistry and fundamental principles of quantum mechanics, statistical mechanics, angular momentum and group theory. Applications. Prerequisite: CHE 322/322L. Recommended: PHY 361. Lecture, 3 hours per week. Laboratory and lab lecture, 6 hours per week.

CHE 435 – Space Science (Morehouse, 4)
This course is designed to introduce students to the mysteries of the universe. Scientific disciplines covered include space astronomy, the science of celestial bodies that make up the universe; space astrophysics, the application of physical laws to the study of astronomy; space physics, the interaction of the Sun's solar wind and the Earth's atmosphere; space biology, the origin and evolution of living organisms in space; and planetary exploration, the study of the planets in the solar system. Topics will be presented via lectures, video, view graphs, class discussion, reference materials, and guest lectures. Prerequisite: CHE 322/322L. Lecture, 3 hours per week.

CHE 437 – Instrumental Methods in Atmospheric Chemistry (Morehouse, 4)
This course provides an introduction to the chemistry and dynamics of atmospheric processes, the spectroscopy of atomic and molecular species, the photodynamics and photokinetics resulting from photochemical processes, and the instrumental techniques used in obtaining basic information about chemical processes in the atmosphere. Prerequisite: CHE 322/322L. Lecture, 3 hours per week. Laboratory and lab lecture, 5 hours per week.

CHE 471, 472 – Advanced Organic Chemistry (Morehouse, 3)
This course provides a deeper understanding of the structure of organic compounds and the mechanisms of organic reactions. The three main broad topics are structure, dynamics, and synthesis. The quantum mechanical basis for aromaticity is carefully examined, and the concept of the duality of (competing) mechanisms is treated in some detail. Prerequisite: CHE 322/322L. Lecture, 3 hours per week.

CHE 421 – Advanced Inorganic Chemistry (Clark Atlanta University, 3)
This course is an introduction to the descriptive chemistry of the elements. The topics covered in this course include: Brønsted and Lewis acids and bases, electronic and molecular structure and coordination chemistry. Prerequisites: CCHE 341/341L/341R, and CCHE 342/342L/342R. Lecture, 3 hours per week. Lab 1 hour per week.

CHE 431 – Advanced Organic Chemistry (Clark Atlanta University, 3)
This course is a study of the advanced topics in carbon chemistry. The topics covered include critical evaluation of modern organic theory mechanisms and rearrangements. It also includes a detailed study of important organic reactions and their application to selected laboratory experiments. Prerequisites: CCHE 231/231L/231R and CCHE 232/232L/232R. Lecture, 3 hours per week. Lab 1 hour per week.

CHE 432 – Advanced Organic Chemistry (Clark Atlanta University, 3)
This course covers the theory and techniques used in the determination of the structure of organic compounds. The topics covered include separation techniques as well as the use of UV/VIS, IR, NMR, ESR, Raman and mass spectroscopy to elucidate structures of organic compounds. Prerequisite: CCHE 431/431L. Lecture, 3 hours per week. Lab 1 hour per week.

CHE 480 – Special Topics in Chemistry (Clark Atlanta University, 4)
This course provides a detailed study of a series of advanced topics in any area of chemistry. Students undertake independent projects. Lecture, 3 hours per week. Lab 1 hour per week.

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