Department of Chemistry and Biochemistry

The Department of Chemistry and Biochemistry offers a well-balanced program for the education of its students. To prepare them for their professional careers, the Department is committed to providing quality teaching and research experiences emphasizing critical and independent thought. The curriculum provides strong innovative instruction in the theory and practice of the chemical sciences. It is designed to introduce students to modern laboratory methods and technology using state-of-the-art scientific equipment. The faculty is committed to providing an environment that addresses the individual needs of each student and encourages them to develop their potential through life-long learning and to be responsible members of their profession and community.

Chemistry Majors

- Chemistry B.S.CHEM (Concentration in Biochemistry) (http://catalog.georgiasouthern.edu/archive/2017-2018/undergraduate/science-mathematics/chemistry/chemistry-bschem-concentration-biochemistry)

Chemistry Minor


CHEM 1030 Chemistry and Your World
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduces students to the many ways in which chemistry affects their lives. Topics include plastics, nutrition, drug design and the many aspects of environmental chemistry. Decision-making activities related to real-world societal issues will help develop critical thinking skills.

CHEM 1040 Chemistry and the Environment
0,4 Credit Hours. 0,3 Lecture Hours. 0,2 Lab Hours.
Students will study the fundamental aspects of chemistry in its political, economic, social, and international context. The laboratory will be a primary component of the course in that some of the course material will be first experienced in the laboratory. The laboratory will stress experimental design and data analysis as applied to environmental science.

CHEM 1145 Principles of Chemistry I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Introduces students to many of the basic concepts of chemistry, emphasizing chemical structure. Beginning at the atom, the course evolves to a consideration of chemical bonding and intermolecular forces, ending with phase changes; the chemical reactions involving changes in the states of matter.

Cross Listing(s): CHEM 1145H.

CHEM 1145H Principles of Chemistry I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Introduces students to many of the basic concepts of chemistry, emphasizing chemical structure. Beginning at the atom, the course evolves to a consideration of chemical bonding and intermolecular forces, ending with phase changes; the chemical reactions involving changes in the states of matter.

Cross Listing(s): CHEM 1145.

CHEM 1146 Principles of Chemistry II
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Completes the introduction to chemistry, focusing on advanced topics of chemical reactivity (including kinetics, thermodynamics and equilibrium) and concludes with a detailed look at the applications of chemistry to a variety of issues and problems in society.

Prerequisite(s): A minimum grade of "C" in CHEM 1145.

Cross Listing(s): CHEM 1146H.

CHEM 1146H Principles of Chemistry II
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Completes the introduction to chemistry, focusing on advanced topics of chemical reactivity (including kinetics, thermodynamics and equilibrium) and concludes with a detailed look at the applications of chemistry to a variety of issues and problems in society.

Prerequisite(s): A minimum grade of "C" in CHEM 1145.

Cross Listing(s): CHEM 1146.

CHEM 1147 Comprehensive General Chemistry
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Fundamental laws and theories of chemical reactions. Topics include atomic structure, bonding, theory, stoichiometry, properties of matter; chemical thermodynamics, electrochemistry and kinetics. Prior completion of a high school chemistry course is highly recommended.

CHEM 1151 Survey of Chemistry I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
First course in a two-semester sequence covering elementary principles of general, organic and biochemistry designed for allied health professional majors. Topics to be covered include elements and compounds, chemical equations, nomenclature, and molecular geometry. Laboratory exercises supplement the lecture material.

CHEM 1152 Survey of Chemistry II
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Second course in a two-semester sequence covering elementary principles of general, organic and biochemistry designed for allied health professions majors. Laboratory exercises supplement the lecture material.

Prerequisite(s): A minimum grade of "C" in CHEM 1151 or CHEM 1146.

CHEM 1211K Principles of Chemistry I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
First course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Topics to be covered include composition of matter, stoichiometry, periodic relations, and nomenclature. Laboratory exercises supplement the lecture material.

Prerequisite(s): A minimum grade of "C" in MATH 1111.

Cross Listing(s): CHEM 1145.

CHEM 1212K Principles of Chemistry II
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Second course in a two-semester sequence covering the fundamental principles and applications of chemistry designed for science majors. Laboratory exercises supplement the lecture material.

Prerequisite(s): A minimum grade of "C" in CHEM 1145 or CHEM 1211K.
CHEM 2030  Principles of Chemistry Research
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.
A course designed to develop basic research and laboratory skills in chemistry majors. Skills to be covered include literature and scientific writing, scientific ethics, report writing, presentation skills, waste handling, chemical labeling, MSDS sheets, and appropriate use of common equipment. Additional topics to be covered include career options for chemists and resume/interviewing skills.
Prerequisite(s): A minimum grade of "C" in CHEM 1146.

CHEM 2242  Analytical Chemistry
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
The study of modern quantitative determination methods, including volumetric and gravimetric analyses, equilibrium calculations, and acid/base chemistry, as well as the fundamental theory of chromatography, spectrscoopy, and electrochemistry.
Prerequisite(s): A minimum grade of "C" in CHEM 1146 and prior or concurrent enrollment in CHEM 2030.
Cross Listing(s): CHEM 2242H.

CHEM 2242H  Analytical Chemistry Honors
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
The study of modern quantitative determination methods, including volumetric and gravimetric analyses, equilibrium calculations, and acid/base chemistry, as well as the fundamental theory of chromatography, spectrscoopy, and electrochemistry.
Prerequisite(s): A minimum grade of "C" in CHEM 1146 and CHEM 2030.

CHEM 2541  Bioanalytical Chemistry
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
This course deals with the analysis of molecules in biological systems. It is designed to provide students with in-depth information on several instrumental analytical techniques and to promote integration of analytical thinking when dealing with biological systems. Topics include chemical and biochemical analysis of biomolecules, instrumental techniques of analysis, isolation and purification of biomolecules, applications of bioanalytical chemistry in medicine, biotechnology, and forensic science. The interpretation and significance of analytical data will be illustrated by selected case studies and data collected by the students themselves in the laboratory sessions that will run concurrently with the course.
Prerequisite(s): A minimum grade of "C" in CHEM 1146 and CHEM 2030.

CHEM 3020  Scientific Glassblowing
2 Credit Hours.  0 Lecture Hours.  6 Lab Hours.
Develops the fundamental glassblowing skills required for the construction of glassware used in scientific investigations.
Prerequisite(s): Junior standing and science major required.

CHEM 3090  Special Topics in Chemistry
0-5 Credit Hours.  0-3 Lecture Hours.  0-6 Lab Hours.
An intensive study in a specialized field of chemistry. Provides an in-depth look at an area of special interest which is not a part of the standard coursework in chemistry.
Prerequisite(s): Permission of instructor required.

CHEM 3140  Advanced Inorganic Chemistry
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
Introduces students to a broad overview of modern inorganic chemistry. Included are considerations of molecular symmetry and group theory, bonding and molecular orbital theory, structures and reactivities of coordination compounds, organometallic chemistry, catalysis and transition metal clusters. Laboratory experiences will include the measurement of several important features of coordination compounds, such as their electronic spectra and par magnetism, as well as the synthesis and characterization of organometallic compounds.
Prerequisite(s): A minimum grade of "C" in CHEM 3342 and CHEM 2242.

CHEM 3341  Organic Chemistry I
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
Introduces the fundamental concepts of structure and reactivity of organic compounds. Topics covered include the chemistry of alkanes, alkenes, alkynes, aromatic compounds, aldehydes, ketones, amines, and carboxylic acids and their derivatives. Emphasizes the synthetic and mechanistic aspects of these compounds and will continue the study of spectroscopy of organic compounds.
Prerequisite(s): A minimum grade of "C" in CHEM 1146.
Cross Listing(s): CHEM 3341H.

CHEM 3341H  Organic Chemistry I Honors
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
A continuation of CHEM 3341 focusing on alkenes, aromatic compounds, aldehydes, ketones, amines, and carboxylic acids and their derivatives. Emphasizes the synthetic and mechanistic aspects of these compounds and will continue the study of spectroscopy of organic compounds.
Prerequisite(s): A minimum grade of "C" in CHEM 3341.
Cross Listing(s): CHEM 3342H, CHEM 3342S.

CHEM 3342  Organic Chemistry II
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
A continuation of CHEM 3341 focusing on alkenes, aromatic compounds, aldehydes, ketones, amines, and carboxylic acids and their derivatives. Emphasizes the synthetic and mechanistic aspects of these compounds and will continue the study of spectroscopy of organic compounds.
Prerequisite(s): A minimum grade of "C" in CHEM 3341.
Cross Listing(s): CHEM 3342, CHEM 3342S.

CHEM 3342H  Organic Chemistry II Honors
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
A continuation of CHEM 3341 focusing on alkenes, aromatic compounds, aldehydes, ketones, amines, and carboxylic acids and their derivatives. Emphasizes the synthetic and mechanistic aspects of these compounds and will continue the study of spectroscopy of organic compounds.
Prerequisite(s): A minimum grade of "C" in CHEM 3341.
Cross Listing(s): CHEM 3342, CHEM 3342S.

CHEM 3343  Introduction to Molecular Modeling
3 Credit Hours.  3 Lecture Hours.  0 Lab Hours.
This course explores the use of computational chemistry models and their application to chemical research. Topics include the computational methods and model chemistries, single-point energy calculations, geometry optimizations, relative energies and stabilities, calculations of NMR chemical shifts, and vibrational frequency calculations among other topics.
Prerequisite(s): A minimum grade of "C" in CHEM 3341.

CHEM 3441  Chemical Kinetics & Thermodynamics
0.4 Credit Hours.  0.3 Lecture Hours.  0.3 Lab Hours.
A survey of chemical kinetics and thermodynamics. Covers the kinetic theory of gases, rates of reaction, integrated rates, rate laws and reaction mechanisms, followed by a development of the three laws of thermodynamics, chemical and phase equilibria and solution thermodynamics.
Prerequisite(s): A minimum grade of "C" in CHEM 2242, MATH 2242, PHYS 2211, and PHYS 1113.
Cross Listing(s): CHEM 3441H.
CHEM 3441H Chemical Kinetics & Thermodynamics Honors
0.4 Credit Hours. 0.3 Lecture Hours. 0.3 Lab Hours.
A survey of chemical kinetics and thermodynamics. Covers the kinetic theory of gases, rates of reaction, integrated rates, rate laws and reaction mechanisms, followed by a development of the three laws of thermodynamics, chemical and phase equilibria and solution thermodynamics.
Prerequisite(s): A minimum grade of "C" in CHEM 2242, MATH 2242, PHYS 2211, and PHYS 1113.
Cross Listing(s): CHEM 3441.

CHEM 3442 Introduction to Quantum Chemistry
0.4 Credit Hours. 0.3 Lecture Hours. 0.3 Lab Hours.
A development of quantum chemistry and its application in a number of relevant areas. Covers atomic structure, molecular structure, molecular spectroscopy, and statistical mechanics.
Prerequisite(s): A minimum grade of "C" in CHEM 2242, MATH 2242, PHYS 2212, and PHYS 1114.

CHEM 3530 Principles of Biochemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A biochemistry course focused on the structure and function of nutrient molecules. Topics include the structure of carbohydrates, lipids, proteins, enzyme function, energetics of metabolism, and metabolic pathways relevant to nutrition.
Prerequisite(s): A minimum grade of "C" in CHEM 3342.

CHEM 3541 Biophysical Chemistry
0.4 Credit Hours. 0.3 Lecture Hours. 0.3 Lab Hours.
This course explores the physical principles underlying the complex nature of living systems. Topics include the theory and applications of thermodynamics, equilibrium, kinetics, and molecular motion and transport as they relate to biological systems. The structure of biomolecules and the main techniques of structure determination (with emphasis on protein structure) as well as bioenergetics will also be covered.
Prerequisite(s): A minimum grade of "C" in all of the following: CHEM 5541, MATH 2242, PHYS 1114, PHYS 1112 or PHYS 2212.

CHEM 3790 Teaching Internship in Chemistry
1-3 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
Student internship in the laboratory component of CHEM 1040 (Chemistry and the Environment) under the mentorship of a faculty member. The student will participate in an introductory workshop immediately prior to the start of the semester, intern in the CHEM 1040 laboratory and meet with the faculty mentor one hour each week. One credit hour per laboratory section of CHEM 1040 in which the student interns.
Prerequisite(s): Permission of the instructor and one of the following: CHEM 2030 or CHEM 3341. 1 credit hour per laboratory section of CHEM 1040 in which the student interns.

CHEM 4130 Industrial Chemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will provide an overview of the chemical industry. In addition to providing a basic understanding of the top 50 industrial chemicals, their manufacturing processes, and raw materials sources, the course will also cover the origin and manufacture of basic petroleum feed stocks and petrochemicals; catalysis; pulp and paper chemistry; polymers and plastics; adhesives, sealants, and glues; agricultural chemistry; pharmaceutical chemistry; and selected topics of importance to the industry.
Prerequisite(s): A minimum grade of "C" in CHEM 3140.

CHEM 4234 Advanced Spectroscopy
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
Introduces students to modern chemical structure elucidation using spectroscopic techniques. Details of multi-nuclear one dimensional NMR spectra are discussed in depth, detailing both the background behind the techniques and their use in determining chemical structure. Multi-nuclear two-dimensional NMR spectra are used introduced as well, as well as the use of Fourier Transform IR spectroscopy and UV-Vis region spectroscopy.
Prerequisite(s): A minimum grade of "C" in CHEM 3342 and CHEM 2242.

CHEM 4241 Instrumental Analysis
0.4 Credit Hours. 0.4 Lecture Hours. 0.3 Lab Hours.
The study of modern spectroscopy and chromatography methods. The spectroscopic methods to be covered may include mass spectrometry, ultraviolet/visible spectroscopy, fluorescence spectroscopy, atomic spectroscopy, infrared spectroscopy and raman spectroscopy. The chromatographic methods to be covered may include gas chromatography, liquid chromatography, supercritical fluid chromatography, thin-layer chromatography and capillary zone electrophoresis.
Prerequisite(s): A minimum grade of "C" in CHEM 2242.

CHEM 4242 Electrochemical Analysis
0.4 Credit Hours. 0.4 Lecture Hours. 0 Lab Hours.
Theory and practice of modern electrochemical methods of analysis. These methods include potentiometry, coulometry, voltammetry, computer simulation and other modern forms of electrochemical analysis.
Prerequisite(s): A minimum grade of "C" in CHEM 2242.

CHEM 4243 Principles of Chemical Separations
4 Credit Hours. 3 Lecture Hours. 3 Lab Hours.
This course will examine theories, and models of separation with applications to the analyses of a wide range of chemical, biological, and environmental samples. Topics include high-resolution gas chromatography and high-performance liquid chromatography. Emphasis is on the theory of reverse-phase, normal-phase, ion-exchange, size-exclusion, and affinity-based separations. Instrumentation such as detectors, pumps, and columns, and data acquisition and analysis are also presented.
Prerequisite(s): A minimum grade of "C" in CHEM 2242.

CHEM 4334 Polymer Materials
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course will introduce the world of polymer materials, which have become ubiquitous in daily life. The course will cover how polymers are synthesized and characterized, the unique properties of polymers, and how polymer materials are used. Important concepts on polymer structure, molecular weight and its distribution, glass transition, and amorphous versus crystalline state will be introduced.
Prerequisite(s): A minimum grade of "C" in CHEM 3341.

CHEM 4335 Green Chemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course focuses on understanding the basic principles of green chemistry and applying them to make organic reactions and processes environmentally benign. Other course topics will include the study of the earth and its atmosphere, the concept of atom economy, catalysis, and enzyme catalysis, as well as green reaction media and the use of various renewable energy sources in organic reactions.
Prerequisite(s): A minimum grade of "C" in CHEM 3342.
CHEM 4790 Chemistry Internship
1-4 Credit Hours. 0 Lecture Hours. 0 Lab Hours.
Intended primarily for students who plan to seek employment in the chemical industry after graduation rather than going on to graduate or professional studies, this course will provide students with practical experience in industry and business. Students will secure employment on their own, earning academic credit and possible compensation, and gain practical experience and technical training. Students must complete a minimum of 120 hours of on-site work for each credit hour earned.

CHEM 4890 Chemical Research Experience
1-4 Credit Hours. 0 Lecture Hours. 3-12 Lab Hours.
An independent research experience in which a student will investigate a research problem under the direction of a faculty member. All laboratory.
Prerequisite(s): Permission of instructor required.

CHEM 5233 Environmental Chemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A survey of the current environmental issues and the underlying chemistry associated with them, including stratospheric chemistry, air pollution, global climate change, toxic organic chemicals, natural water systems, soil chemistry, and energy production.
Prerequisite(s): A minimum grade of "C" in CHEM 2242 and CHEM 3342.
Cross Listing(s): CHEM 5233G.

CHEM 5311 Advanced Organic Chemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
A course designed to build upon the knowledge gained in CHEM 3341 (Organic I) and CHEM 3342 (Organic II). Topics covered may include considerations of structural and mechanistic organic chemistry, synthetic organic chemistry and bioorganic chemistry.
Prerequisite(s): A minimum grade of "C" in CHEM 3442.
Cross Listing(s): CHEM 5311G.

CHEM 5331 Principles of Drug Design
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
5331GA course designed to introduce the chemistry of drug design and development, as well as drug actions and their impacts on society. Topics include drug discovery, receptor site theory, neurotransmitters, pharmacokinetics, federal drug laws, drugs in sports and individual classes of drugs.
Prerequisite(s): A minimum grade of "C" in CHEM 3342.
Cross Listing(s): CHEM 5332G.

CHEM 5333 Carbohydrate Chemistry
3 Credit Hours. 3 Lecture Hours. 0 Lab Hours.
This course provides students with an introduction to the chemistry of carbohydrates. Topics include structural aspects, stereochemistry, synthesis, conformational analysis, polysaccharides, and vaccine development.
Prerequisite(s): A minimum grade of "C" in CHEM 3342.
Cross Listing(s): CHEM 5333G.

CHEM 5541 Biochemistry I
0,4 Credit Hours. 0,3 Lecture Hours. 0,3 Lab Hours.
Surveys the fundamental principles of protein structure, enzyme mechanisms, carbohydrate structure, and the major metabolic pathways of carbohydrate metabolism.
Prerequisite(s): A minimum grade of "C" in CHEM 3342.
Cross Listing(s): CHEM 5541H, CHEM 5541G.