B.A / B.S in Chemistry and B.S. in Biochemistry Learning Outcomes

Program	B.A. / B.S. Chemistry and B.S. Biochemistry
Department(s)	Chemistry
College	Sciences

1. Student Learning Outcomes for the program. List the Student Learning Outcomes for the program. *Number for later reference.*

Upon completion of the B.S. program in Chemistry students would have satisfactorily completed an intensive and comprehensive undergraduate program as identified by the American Chemical Society Committee on Professional Training (ACS-CPT). This program includes introductory and foundational course work in chemistry, in-depth course work in chemistry and a laboratory emphasis, including research experience that provides for the development of the professional skills needed to be an effective chemist.

The B.S. program in Biochemistry requires satisfactory completion of the same introductory and foundational course work, in-depth course work in chemistry and biochemistry with laboratory emphasis. It also provides for flexibility in the selection of in-depth biology course electives to complement the rigorous chemistry foundation of the program.

The B.A. program in Chemistry requires the same foundational course work and much of the in-depth course work in chemistry along with a substantial laboratory experience. This program provides greater flexibility in the selection of advanced chemistry course work along with elective courses offered by departments from within the College of Sciences as well as other colleges within the university.

Enrollment, retention, and grading data is collected and evaluated on selective courses required by these three chemistry programs and identified as a major course area by the ACS-CPT. Assessments on the Student Learning Outcomes will be built into each of the courses.

1. General Chemistry, foundational courses that are also identified as service courses required by other degree programs. Foundational courses cover topics including but not limited to states of matter, atomic structure, electron configurations, formulas, nomenclature, periodic properties of the elements, mole concepts, molecular / formula mass, empirical and molecular formulas, chemical bonding, molecular geometry, intermolecular and intramolecular forces, balancing equations, stoichiometry, solution chemistry and reactions, gas laws, chemical equilibrium, acid – base chemistry, oxidation-reduction reactions, thermodynamics, chemical kinetics, and electrochemistry. These topics

makeup the essential framework of all college level general chemistry courses for science and engineering majors. Outcome: Upon completion of these foundational courses, students will demonstrate an understanding of, and competence with the application of the principles of the topics listed above in their study of General Chemistry.

2. Organic Chemistry, foundational and in-depth courses that are also identified as service courses required by other degree programs. Separate laboratory courses for chemistry majors provide the hands-on in-depth experiences with synthesis, chemical separations, measurement of chemical properties, and use of modern instrumentation. Topics include but are not limited to, atomic and electronic structure of carbon as it applies to the chemistry of various types of organic compounds such as aliphatic and aromatic compounds, alcohols, aldehydes, carboxylic acids and their derivatives, amines, carbohydrates among others. These studies include structures, nomenclature, synthesis and reactions of each functional group, physical and chemical properties and applications of separation and purification as well as instrumental analytical techniques. These topics provide the foundational and some of the in-depth topics common to organic chemistry courses that are part of programs approved by the American Chemical Society. Outcome: Upon completion of these foundational and in-depth courses, students will demonstrate an understanding of, and competence with the application of the principles of the topics listed above in their study of Organic Chemistry.

3. Biochemistry, foundational and in-depth courses that are also identified as service courses required by other degree programs. These courses include such topics as the structure and function of amino acids, proteins, carbohydrates, lipids, nucleic acids, enzymes, cellular and specialized membranes, metabolism and metabolic (catabolic and anabolic) mechanisms, metabolic regulatory mechanisms, genetic mechanisms, transport mechanisms, intra-cellular communication mechanisms, inter-cellular and hormone communication mechanisms among others. Outcome: Upon completion of these foundational and in-depth courses, students will demonstrate an understanding of, and competence with the application of the principles of the topics listed above in their study of Biochemistry.

4. Analytical Chemistry, a lecture and laboratory experience providing foundational and in-depth course topics such as gravimetric, titrimetric, complexometric, potentiometerc, colorimetric, chromatographic and spectroscopic methods. These and other topics are presented with emphasis upon chemical calculations including computational data analysis and modeling, and equilibrium considerations to prepare graduates to perform in a modern chemical laboratory. Outcome: Upon completion of these foundational and in-depth courses, students will demonstrate an understanding of, and competence with the application of the principles of the topics listed above in their study of Analytical Chemistry.

5. Instrumental Analysis, a lecture and laboratory experience providing in-depth course topics using traditional and modern instrumental theory and laboratory analytical techniques, including but not limited to spectroscopy, spectrophotometry, electrochemical methods, thermal analysis, computational data analysis and modeling. Outcome: Upon completion of these in-depth courses, students will demonstrate an understanding of, and competence with the application of the principles of the topics listed above in their study of Instrumental Analysis.

6. Seminar, a course to enhance chemical literature and communication skills.

Summary Outcomes: Upon completion of these foundational and in-depth courses, students should have mastered the vocabulary, concepts, and skills required to successfully complete their studies in these specific areas.

2. Curriculum Alignment of Student Learning Outcomes. Where is the information covered in the courses required in the program?

At what developmental stage is it covered (Beginning, Middle, or End)?

Student Learning Outcomes for the Program →

Courses in program (required & electives)	1 (use #s from 1st page)	2	3	4	5	6				
CHEM 121	B									
CHEM 122	B									
CHEM 241		M								
CHEM 242		M								
CHEM 474			M							
CHEM 475			M							
CHEM 355				M						
CHEM 355L				M						
CHEM 455					M					
CHEM 455L					M					
CHEM 491						E				

B = Beginning, M = Middle, E = End

B = outcome introduced in beginning of development, such as in introductory course

M = outcome covered in middle stages of development

E = outcome fully developed at the end of career, such as in a capstone course