semester) capstone course for the biology major. Selected topics in the history and current literature of science, particularly biology, emphasizing the development of an integrated worldview from the standpoint of the sciences. Required for all biology majors. Prerequisite: senior standing.

Chemistry

Professors:
Jimmie M. Purser, Ph.D.
Timothy J. Ward, Ph.D., Chair

Associate Professor:
Kristina L. Stensaas, Ph.D.

Assistant Professors:
L. Lee Lewis, Ph.D.
Wolfgang H. Kramer, Ph.D.
Mark A. Hamon, Ph.D.

Requirements for major: All students pursuing a degree in chemistry must complete the following courses in chemistry with a grade of C or better:

- General Chemistry I and II and General Chemistry Laboratory I and II
- Organic Chemistry I and II and Organic Chemistry Laboratory I and II
- Quantitative Analysis and Applications of Quantitative Analysis
- Physical Chemistry I or Principles of Physical Chemistry
- Chemical Separations or Instrumental Analysis
- Organic Spectral Analysis
- Literature of Chemistry

Students pursuing a B.S. degree with a major in chemistry must satisfy two of their additional degree requirements with College Physics I and II and College Physics Laboratory I and II or General Physics I and II and General Physics Laboratory I and II. Students must take two additional electives from any chemistry, biology, physics or math course numbered above 3000.

The Department of Chemistry is accredited through the American Chemistry Society (ACS) to offer the ACS degree certification. The ACS certified degree provides more in-depth training for those students who wish to pursue graduate studies in chemistry or other advanced studies. To receive the ACS certification, the student must maintain a 2.50 grade-point average in chemistry and must take the following courses in addition to the above-listed requirements:

- Analytical Geometry and Calculus II
- Physical Chemistry I and II
- Advanced Inorganic Chemistry
- Instrumental Analysis
- Two additional chemistry courses numbered above 3000 from the following: 3110, 3310, 3610, 3620, 3730

Students pursuing an ACS degree must take calculus-based General Physics I and II and General Physics Laboratory I and II.
A grade below C will not be accepted for any courses required of a chemistry major or minor.

Requirements for minor: Students may elect a minor in chemistry by taking the following courses:

- General Chemistry I and II and General Chemistry Laboratory I and II
- Organic Chemistry I and II and Organic Chemistry Laboratory I and II
- one additional four-semester-hour chemistry course numbered 2000 or above

Courses

1213 General Inorganic Chemistry I (3 sem. hours). An introduction to the theory, practice, and methods of chemistry. Development of atomic theory, atomic and molecular structure, chemical bonding, periodicity of the elements, stoichiometry, states of matter, and basic energy considerations. This course and Chemistry 1211 fulfill Core 7 or 9. Corequisite: Chemistry 1211.

1211 General Inorganic Chemistry Laboratory I (1 sem. hour). A coordinated course (with General Chemistry I) emphasizing chemical techniques, skills, and methods for qualitative and quantitative analysis of laboratory data and their limitations. This course and Chemistry 1213 fulfill Core 7 or 9. Corequisite: Chemistry 1213.

1223 General Inorganic Chemistry II (3 sem. hours). An introduction to the states of matter, solution and descriptive chemistry, equilibrium, thermodynamics, kinetics, oxidation and reduction, and electrochemistry. This course and Chemistry 1221 fulfill Core 7 or 9. Prerequisite: Chemistry 1213. Corequisite: Chemistry 1221.

1221 General Inorganic Chemistry Laboratory II (1 sem. hour). A coordinated course (with General Chemistry II) to develop chemical techniques. Includes introductory qualitative and quantitative analysis. This course and Chemistry 1223 fulfill Core 7 or 9. Prerequisite: Chemistry 1211. Corequisite: Chemistry 1223.

2110 Organic Chemistry I (4 sem. hours). First in a two-semester program in the application of chemical principles to organic compounds and the elucidation of their chemical and physical properties. Development of theoretical principles including structure determination, reaction mechanisms, kinetics, bond stability, experiment design, stereochemistry, and strategies of organic synthesis. Prerequisite: Chemistry 1223. Corequisite: Chemistry 2111.

2111 Organic Chemistry Laboratory I (1 sem. hour). A coordinated one-hour course (with Chemistry 2110) emphasizing organic synthesis, separation techniques, spectral analysis, and testing of mechanism theory and relative rates. Corequisite: Chemistry 2110.

2120 Organic Chemistry II (4 sem. hours). Second part of a two-semester program; a study of the more common oxygen, nitrogen, sulfur, and halogen derivatives of carbon. Emphasis is placed on structure, stereochemistry, preparation, chemical reactions, and physical properties and their relationship to the properties of biomolecules. Prerequisite: Chemistry 2110. Corequisite: Chemistry 2121.

2121 Organic Chemistry Laboratory II (1 sem. hour). A coordinated one-hour course (with Chemistry 2120) emphasizing more advanced syntheses and use of instruments for separation techniques and spectral analysis. Corequisite: Chemistry 2120.

2310 Quantitative Analysis (4 sem. hours). This course will cover the use of basic statisti-

cal methods to treat sample data. Theories and concepts studied include solution equilibria, acid-base theory, oxidation-reduction, complexation, and solubility equilibria. An introduction to potentiometric and spectroscopic techniques. Prerequisite: Chemistry 1223. Corequisite: Chemistry 2312.

2312 Applications of Quantitative Analysis (2 sem. hours). Gravimetric, titrimetric, and volumetric methods along with statistical methods to evaluate data are presented in the laboratory. Various unknowns are determined utilizing the basic techniques described above. The laboratory will also introduce potentiometry and UV-Visible spectroscopy. Corequisite: Chemistry 2310.

3110 Advanced Organic Chemistry (4 sem. hours). An in-depth study of major organic mechanisms, along with selected topics such as symphoria, heterocyclics, polymers, and molecular orbital modeling. Stereochemical and mechanistic applications are discussed including their application to biomolecules. Prerequisite: Chemistry 2120.

3123 Organic Spectral Analysis (3 sem. hours). Theory and practice of instrumental analysis of organic compounds. Emphasis is on interpretation of data from modern instrumentation. Capabilities and limitations of spectral analyses are considered. Prerequisite: Chemistry 2120.

3210 Advanced Inorganic Chemistry (4 sem. hours). A course designed primarily for students pursuing the American Chemical Society accredited degree in chemistry. This course is an overview of the principles of advanced inorganic chemistry including applications of group theory and symmetry, molecular bonding theories, nomenclature, kinetics and mechanisms, organometallics, polymers, and advanced inorganic laboratory techniques. The course has a lecture and laboratory component. Prerequisites: Chemistry 2310 and Mathematics 1220. Prerequisite or Corequisite: Chemistry 3410 or 3400.

3310 Principles of Chemical Separations (4 sem. hours). Techniques covered include crystallization, distillation, gas and liquid chromatography, counter-current chromatography, micellar chromatography, electrophoretic techniques, and field flow fractionation. This course will also examine general transport theory, formation and properties of Gaussian zones, diffusion, zone broadening, concepts of plate height, resolution, and peak capacity. A laboratory section is included in the course. Prerequisite: Chemistry 2310.

3320 Instrumental Analysis (4 sem. hours). An introduction to the basic design and theory of operation for modern instrumentation. Topics to be covered include flame spectroscopy, UV-visible spectroscopy, fluorescence and phosphorescence, IR, NMR, potentiometry, mass spectrometry, and an introduction to electro-analytical techniques. This course will emphasize the practical applications and limitations of each technique. Included in the course is a laboratory period. Prerequisite: Chemistry 3400 or Chemistry 3410.

3400 Principles of Physical Chemistry (4 sem. hours). This is a noncalculus-based course designed for the general chemistry major and those pursuing careers in the health sciences. Topics covered include structure of matter, gas laws, properties of liquids and solutions, thermodynamics, equilibrium, chemical kinetics, catalysis, and properties of macromolecules. An integrated laboratory is included in the course. Prerequisite: Chemistry 2310.

3410 Physical Chemistry I (4 sem. hours). This course includes the development of theory

and techniques used in kinetics and in thermodynamics and equilibrium of gases, liquids, and solutions (nonelectrolytes and electrolytes). The integrated laboratory includes experiments in the above areas. Prerequisites: Mathematics 1220, Chemistry 2310, Physics 1003.

3420 Physical Chemistry II (4 sem. hours). This course includes quantum chemistry and molecular bonding and structure, as well as the history of the development of quantum mechanics. An integrated laboratory is included in this course and gives practical applications of quantum chemistry through the use of spectroscopy and other techniques. Prerequisites: Chemistry 2310, Mathematics 1220, Physics 1013.

3610 Biochemistry I (4 sem. hours). An introduction to the structure, dynamics, and function of macromolecules: proteins, nucleic acids, and carbohydrates. Topics include replication, transcription, enzyme kinetics, mechanisms of enzyme action, and protein biosynthesis. Prerequisites: Chemistry 2120, Biology 1000.

3620 Biochemistry II (4 sem. hours). An introduction to the basic concepts and design of metabolism. Topics include the generation and storage of metabolic energy, control of gene expression, and the application of biochemical principles to physiological processes, lipids, and biological membranes. Prerequisite: Chemistry 3610.

3700–3703 Undergraduate Research (1–4 sem. hours). Library and laboratory research in special areas under the guidance of the instructor. Prerequisite: permission of the instructor.

3730 Environmental Chemistry (4 sem. hours). An introduction to environmental chemistry as applied to aquatic, atmospheric, soil, and hazardous waste systems. Topics include environmental chemical cycles, aquatic chemistry, atmospheric chemistry, soil chemistry, environmental chemistry of hazardous wastes, and toxicology. Included in the integrated laboratory component is an overview of various environmental chemical analyses. Prerequisites: Chemistry 2120 and Chemistry 2310.

3750–3753 Special Topics in Chemistry (1, 2, 3, or 4 sem. hours). Special areas of study not regularly offered for an organized class of interested students. Prerequisite: permission of the instructor.

3800–3803 Independent Study (1, 2, 3, or 4 sem. hours). Following the basic courses, this offering will permit a student to pursue advanced topics under the direction of the appropriate chemistry staff member.

3850–3853 Internship (1, 2, 3, or 4 sem. hours). Practical experience and training with selected research, educational, governmental, and business institutions. Credit/no credit grading only. Prerequisite: permission of the instructor.

4910 Literature of Chemistry (4 sem. hours). Processing and managing information from the chemical literature with oral and written presentations. History of chemistry and the proper use of chemical literature are included. Prerequisite or Co requisite: Chemistry 2120, 3310, or 3320, 3410, or 3400.