**Academic Regulations**

A grade of “C-” in chemistry as well as cognate courses is the minimal grade acceptable for progression into subsequent chemistry courses. Students who fail to achieve at least a “C-” may repeat the course. If a course is satisfactorily completed, the prior unsatisfactory grade will no longer bar a student from continuing in the Chemistry program.

***Lower Division***

**CHEM 100A Chemistry in Your Life (5)**

A general education course introducing basic concepts of chemistry to the non-science major. The course focuses on the impact of chemistry on daily activities including environmental and other societal concerns. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Not acceptable for the major. **GE B1/B23**

**CHEM 100B CSI: Crime Scene Investigation Chemistry (5)**

A general education course introducing basic concepts of chemistry to the non-science major using examples from forensic science. The course focuses on the use of crime-scene case studies, Sherlock Holmes stories, and true accounts of drug deals, murders, and thefts to introduce chemical principles. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Not acceptable for the major. **GE B1/B3**

**CHEM 100C Chemistry and the Environment (5)**

A general education course introducing basic concepts of chemistry to the non-science major using examples from environmental studies. The course focuses on the use of global warming studies, ozone hole studies, and accounts of the environmental impact of chemistry to introduce chemical principles. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Not acceptable for the major. **GE B1/B3**

**CHEM 100D Chemistry of Beer and Wine (5)**

A general education course introducing basic concepts of chemistry to the non-science major using examples from the beer and wine industries. The course focuses on the use of the processes of beer brewing and wine making to introduce chemical principles. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Not acceptable for the major. **GE B1/B3**

**CHEM 100E Molecular Gastronomy: The Chemistry of Cooking (5)**

A general education course introducing basic concepts of chemistry to the non-science major using examples from cooking and baking. The course focuses on the use of the processes of cooking to introduce chemical principles. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Not acceptable for the major. **GE B1/B3**

**CHEM 101 Preparation for College Chemistry (4)**

A one-quarter course based on a systematic, semi-empirical approach to the submicroscopic world of chemistry. The development of modern ideas concerning atomic and molecular structure, principles of compound formation, and chemical reactivity will be emphasized. Emphasis will be on the development of the skills necessary for success in chemistry. Science majors should consult with their advisors before enrolling in this course. 200 minutes of lecture/discussion per week.

**CHEM 150 General, Organic, and Biochemistry I (5)**

Basic principles of chemistry including the composition of matter, periodic properties, chemical bonding and solution equilibria are introduced using examples from biological systems. Prerequisite: CHEM 101 or a satisfactory score on the Chemistry Placement Test. Recommended co-requisite: CHEM 151. 150 minutes of lecture/discussion and 150 minutes of laboratory. Not acceptable to the major.

**CHEM 151 Problem Solving in General, Organic, and Biochemistry I (1–2)**

Problems out of CHEM 150 are discussed and solved. Must be taken concurrently with CHEM 150. 50 to 100 minutes of discussions.

**CHEM 203 General, Organic and Biochemistry II (5)**

Descriptive chemistry of carbon compounds including structure, reactivity and mechanism. Major focus is on organic compounds of biological and physiological importance as well as metabolism. Prerequisite: CHEM 150 or equivalent within the past five years. 150 minutes of lecture/discussion and 150 minutes of laboratory. Not acceptable to the major.

**CHEM 204 Problem Solving in General, Organic, and Biochemistry II (1–2)**

Problems out of CHEM 203 are discussed and solved. Must be taken concurrently with CHEM 203. Prerequisite: CHEM 150 or equivalent. 50 to 100 minutes of discussions. Not acceptable to the major.

**CHEM 210 Computer Applications in Chemistry (2)**

An introduction that improves the computer application skills to an intermediate level for several commonly programs in the chemical sciences. Common programs in this class include MS Excel, Word, PowerPoint, Mathematica, and ChemDraw. Prerequisites: CHEM 101 or approval of instructor. 100 minutes of lecture/discussion per week.

**CHEM 211 Principles of General Chemistry I (4)**

Introduction to atomic structure, quantum theory, periodic properties, chemical reactions, stoichiometry, gas laws and theories, molecular structure and bonding, states of matter, solutions, acids and bases, chemical equilibrium, thermodynamics, oxidation-reduction, electro-chemistry, chemical kinetics, nuclear chemistry, organic chemistry, descriptive chemistry, and coordination chemistry. Prerequisites: MATH 85 or equivalent, and a satisfactory score on the Chemistry Placement Test or CHEM 101. Pre- or Co-requisite: CHEM 211L. 200 minutes of lecture/discussion.

**CHEM 211L General Chemistry Laboratory I (1)**

Laboratory accompanying CHEM 211. Prerequisites: Math 85 or equivalent, and a satisfactory score on the Chemistry Placement Test or CHEM 101. Pre- or Co-requisite: CHEM 211. 150 minutes of laboratory per week.

**CHEM 212 Principles of General Chemistry II (4)**

A continuation of CHEM 211. Prerequisite: CHEM 211 and 211 L or equivalent. Pre- or Co-requisite: CHEM 212L. 200 minutes of lecture/discussion per week.

**CHEM 212L General Chemistry Laboratory II (1)**

Laboratory accompanying CHEM 212. Prerequisites: CHEM 211 and 211L, or equivalent. Pre- or Co-requisite: CHEM 212. 150 minutes of laboratory.

**CHEM 213 Principles of General Chemistry III (3)**

A continuation of CHEM 212. Prerequisite: CHEM 212 and 212L or equivalent. Pre- or Co-requisite: CHEM 213L. 150 minutes of lecture/discussion per week.

**CHEM 213L General Chemistry Laboratory III (2)**

Laboratory accompanying CHEM 213. Prerequisites: CHEM 212 and 212L, or equivalent. Pre- or Co-requisite: CHEM 213. 300 minutes of laboratory.

**CHEM 241 Introduction to Biotechnology (2)**

Introductory coverage of biotechnology including a broad survey of contemporary applications, and the future outlook of the field. The focus will be to develop an understanding of how biological systems can be manipulated to create applications in medicine, food production, forensics, industry, and environmental remediation. These areas will be covered with a particular emphasis on modern applications and societal implications. 100 minutes of lecture/discussion per week.

**CHEM 270 Concepts of Food Science (2)**

This course employs biological sciences, physical sciences, and engineering in the study of the nature of foods, causes of deterioration, and the principles underlying food processing. Topics include the following: Science and practice of providing a wholesome, nutritious, economical and readily available supply of basic and processed foodstuffs; chemical nature of foods; nutritional requirements; health-related dietary considerations; microorganisms, foodborne illnesses, preservation and processing; food additives; food labeling; food safety and the consumer. Prerequisites: CHEM 213 and 213L. 100 minutes of lecture/discussion.

**CHEM 277 Special Topics in Chemistry (1–5)**

Topics and prerequisites to be announced. May be repeated for different topics.

**CHEM 281 Problem Solving in Chemistry (1–2)**

A workshop in which students work on problems related to their chemistry coursework with help from a facilitator. This workshop is designed to accompany specific chemistry courses which must be taken concurrently. Consult the electronic course description for the acceptable companion course(s).

**CHEM 290 Careers in Chemistry and Biochemistry (1-2)**

An introduction to career opportunities available in the fields of chemistry and biochemistry. Students will learn about career options, graduate school, and professional development through activities, discussion, and guest speakers. Offered on a credit, no-credit basis only. May be repeated twice for credit. Prerequisite: CHEM 213 and 213L or equivalent.

**CHEM 294 Service Learning in Chemistry, Participation & Design (1-3)**

Participation in chemistry-related service learning experiences that meet school and/or community needs. Beginning students will assist in the implementation of service learning projects. Advanced students will design and implement service learning projects. Schedule is negotiated by the student, instructor, and community partners. Course may be repeated up to six times with permission of the instructor. Offered on a credit, no-credit basis only. Interested students should contact the department office. Prerequisite: CHEM 211 and 211L or permission of instructor.

***Upper Division***

**CHEM 300 Environmental Chemistry (3)**

A detailed study of current topics of environmental chemistry including air pollution, the ozone layer, greenhouse effect, renewable energy, toxic organic compounds, water chemistry and water pollution. Prerequisites: CHEM 213 and 213L. 150 minutes of lecture/discussion per week.

**CHEM 310 Concepts of Geochemistry (5)**

Distribution of elements within the earth, their mobilities and interactions during crustal processes. Methods of investigation, application to geologic and environmental studies and petroleum and minerals exploration. Field and laboratory investigations and presentations. Same as GEOL 310. Prerequisites: CHEM 213 and 213L, GEOL 303 or CHEM 351 and some geology course work. (Recommended: MATH 202) A field trip may be required. 200 minutes of lecture/discussion and 150 minutes of laboratory per week. Consult the Course Schedule for specific details.

**CHEM 331 Concepts of Organic Chemistry I (5)**

A detailed study of the structure and reactivity of organic compounds. Prerequisite: CHEM 213 and 213L or equivalent. 200 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 332 Concepts of Organic Chemistry II (5)**

A continuation of CHEM 331. Prerequisite: CHEM 331 or equivalent. 150 minutes of lecture/discussion and 300 minutes of laboratory per week.

**CHEM 333 Concepts of Organic Chemistry III (5)**

A continuation of CHEM 332. Prerequisite: CHEM 332 or equivalent. 150 minutes of lecture/discussion and 300 minutes of laboratory per week.

**CHEM 340 Concepts of Biochemistry (4)**

Biochemical equilibria and thermodynamics, biologically important chemical compounds, metabolism of carbohydrates, fats and proteins. Prerequisite: CHEM 332 or equivalent. 150 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 341 Concepts of Biotechnology (3)**

In depth coverage of biotechnology with a particular focus on the molecular manipulation of genetic elements for specific applications. Review of the fundamental aspects of cell biology and biochemistry and discussion of a variety of biotechnological applications. Our discussion will emphasize medically related biotechnology such as the production of pharmaceuticals, gene therapy, stem cell research, and the human genome project. Prerequisites: CHEM 241 or 340. 150 minutes of lecture/discussion per week.

**CHEM 350 Quantitative Analytical Chemistry (5)**

The practice and theory of chemical laboratory methods including techniques of gravimetric, volumetric, spectrophotometric analysis and separation, and introductory instrumental analysis with a focus on precision and accuracy of experimental data. Prerequisite: CHEM 213 and 213L or equivalent. Two lectures, one discussion and two laboratories.

**CHEM 356 Concepts of Food Analysis (4)**

Study of the fundamental chemical principles of food analysis with the laboratory work including both the classical and the more recent sophisticated methods of chemical analysis. Prerequisite: CHEM 213 and 213L or equivalent. 150 minutes of lecture/discussion and 150 minutes of laboratory.

**CHEM 361 Concepts of Physical Chemistry, Thermodynamics (4)**

Introduction to topics such as chemical thermodynamics, properties of solutions, phase equilibria and electrochemistry. Prerequisites: MATH 202, PHYS 201, CHEM 213 and 213Lor consent of instructor. 150 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 362 Concepts of Physical Chemistry, Kinetics (3)**

Introduction to topics such as chemical kinetics, elementary statistical thermodynamics and transport properties. Prerequisites: MATH 202, PHYS 201, CHEM 213 and 213Lor consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 363 Concepts of Physical Chemistry, Quantum Mechanics (4)**

Introduction to topics such as quantum chemistry, atomic and molecular spectroscopy. Prerequisites: MATH 202, PHYS 201, CHEM 213 and 213Lor consent of instructor. 150 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 365 Concepts of Biophysical Chemistry (6)**

Introduction to topics such as chemical thermodynamics, properties of solutions, phase equilibria, chemical kinetics, quantum chemistry, and electrochemistry with examples drawn from biochemistry. Prerequisites: MATH 212, PHYS 201, CHEM 213 and 213Lor consent of instructor. 200 minutes of lecture/discussion and 300 minutes of laboratory per week.

**CHEM 390 Seminar in Chemical Literature (3)**

Seminar in the use of modern chemical literature and literature data bases. Must be completed before enrolling in CHEM 490. Prerequisite: at least 135 units and CHEM 340 or 361. 150 minutes of lecture/discussion per week.

**CHEM 391 Seminar in Biochemical Literature (3)**

Seminar in the use of modern biochemical literature and literature data bases. Must be completed before enrolling in CHEM 491. Prerequisite: at least 135 units and CHEM 340. 150 minutes of lecture/discussion per week.

**CHEM 401 Concepts of Chemical Symmetry (3).** Introduction to methods in symmetry used in the chemical sciences. Applications include 3D chemical structures and spectroscopy. Prerequisite: CHEM 332 or consent of instructor. 150 minutes of lecture/discussion per week.

**CHEM 410 Concepts of Computational Chemistry (3)**

Introduction to basic computational methods used in the chemical sciences. Applications include computational methods in electronic structure, 3D biomolecular modeling, magnetic/optical/spectroscopic properties of molecules, reaction thermochemistry, and reaction dynamics. Prerequisites: CHEM 332 or consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 421 Concepts of Bioinorganic Chemistry (4)**

An analysis of the major theories of biologically important metals with particular emphasis on the bio-distribution of metal ions. Structure and function of metal enzymes and metal DNA complexes and organometallic compounds; model compounds and medicinal inorganic chemistry. Prerequisite: CHEM 332 or consent of instructor. 150 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 422 Concepts of Physical Inorganic Chemistry (4)**

An analysis of the major theories of chemical bonding with particular emphasis on transition metal complexes. Structure, physiochemical properties and reactivity of classical metal complexes and organometallic compounds; mechanisms of inorganic reactions in aqueous and nonaqueous media. Prerequisite: CHEM 332 or consent of instructor. 150 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 430 Concepts of Macromolecular Chemistry (3)**

Structure, properties, synthesis and analysis of synthetic and natural macromolecules; includes an introduction to supramolecular chemistry and self-assembly. Prerequisite: CHEM 333 or consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 440 Advanced Biochemistry (5)**

Principles underlying interactions of biological systems on the cellular, subcellular and molecular levels; membrane transport models, protein structure, function and kinetics. Prerequisites: CHEM 340 and 353 or consent of instructor. 150 minutes of lecture/discussion and 300 minutes of laboratory per week.

**CHEM 441 Concepts of Protein Chemistry (3)**

An in-depth view of protein structure and the correlation of structural properties to biological function. Topics include chemical properties of polypeptides, protein biosynthesis, post-translational modifications, protein-protein interactions, structure-function relationships, evolutionary and genetic origins of proteins, and biological mechanisms. This course also introduces students to the area of bioinformatics. Prerequisites: CHEM 340 or approval of instructor. 150 minutes of lecture/discussion per week

**CHEM 442 Biochemistry of Nucleic Acids (4)**

Structures and mechanistic features of enzymes involved in DNA and RNA replication or synthesis, the structural determinants related to gene expression, and the chemical processes involved in gene mutation and recombination. Regulation of gene expression, genome replication, recombination, and repair. 150 minutes of lecture/discussion and 150 minutes of laboratory. Prerequisite: CHEM 440

**CHEM 451 Instrumental Analysis, NMR (3)**

Principles of Nuclear Magnetic Resonance (NMR) spectroscopy and its application in modern instrumental analysis. Prerequisite: CHEM 332 or consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 452 Instrumental Analysis, Separations (3)**

Principles and techniques of modern instrumental analysis methods including gas chromatography, HPLC, and mass spectrometry. Prerequisite: CHEM 332 or consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 453 Instrumental Analysis, Spectroscopy (3)**

Principles and techniques of modern instrumental analysis methods including UV-Vis spectroscopy, IR spectroscopy and electrochemistry. Prerequisite: CHEM 332 or consent of instructor. 100 minutes of lecture/discussion and 150 minutes of laboratory per week.

**CHEM 470 Food Chemistry (4)**

Properties of biological molecules (e.g., proteins, enzymes lipids, carbohydrates and pigments) found in foods and pharmaceuticals. Basic elements of molecules, such as structure and reactive groups, are presented in regard to how they affect the properties of foods and pharmaceuticals. Reactions such as Maillard browning and lipid oxidation are discussed regarding mechanisms, products and controlling processes. 150 minutes of lecture/discussion and 150 minutes of laboratory. Prerequisite: CHEM 340 and BIOL 201

**CHEM 471 Advanced Nutrition and Metabolism (3)**

Nutritional biochemistry and physiology as it relates to establishment of nutrient requirements and Dietary Reference Intakes. Digestion, absorption, metabolism, storage, and excretion of nutrients and other markers of nutritional adequacy or excess with emphasis on micronutrients. Functions of nutrients, in bone muscle, blood, growth and development and communication. Prerequisite: CHEM 340 and BIOL 270. 150 minutes of lecture/discussion.

**CHEM 475 Food Industrial Practicum (1–5)**

Enhancement of student’s practical knowledge of food science by participating in projects sponsored by industrial and/or governmental agencies. A maximum of 5 units can be applied to the major. Prerequisite: Permission of instructor.

**CHEM 477 Special Topics in Chemistry (1–5)**

Topics and prerequisites to be announced. May be repeated for different topics.

**CHEM 480 Honors Research (5)**

Individual study on a current research problem with faculty supervision, preparation of a paper. Course may be repeated twice with permission of the instructor. Normally a maximum of five units may be used for major department credit. Units in excess of five may be used for upper division elective credit. Prerequisite: Invitation by faculty.

**CHEM 489 Experiential Prior Learning (1–5)**

Evaluation and assessment of learning which has occurred as a result of prior off-campus experience relevant to the curriculum of the department. Course may be repeated twice with permission of the instructor. Normally a maximum of five units may be used for major department credit. Units in excess of five may be used for upper division elective credit. Available by petition only, on a credit, no-credit basis. Not open to postgraduate students. Interested students should contact the department office.

**CHEM 490 Senior Seminar (3)**

Presentation of papers and discussion on either a topic or a group of related topics by faculty and students. Prerequisite: Major or minor in chemistry and CHEM 390. 150 minutes of lecture/discussion per week.

**CHEM 491 Senior Seminar (3)**

Presentation of papers and discussion on either a topic or a group of related topics by faculty and students. Prerequisite: Major or minor in biochemistry and CHEM 391. 150 minutes of lecture/discussion per week.

**CHEM 495 Instruction in Chemistry (1–5)**

Experience supporting teaching activities in the laboratory and/or guiding problem solving sessions. Interested students should speak with the department chair in advance to coordinate. Normally, a maximum of six units may be used for major department credit. May be repeated for credit.

**CHEM 494 Service Learning in Chemistry, Leadership (1-3)**

Leadership in chemistry-related service learning experiences that meet school and/or community needs. Students will lead a team in the design and implementation of service learning projects. Schedule is negotiated by the student, instructor, and community partners. Course may be repeated up to six times with permission of the instructor. Offered on a credit, no-credit basis only. Interested students should contact the department office. Prerequisite: CHEM 294 or permission of instructor.

**CHEM 496 Internship in Chemistry (1–5)**

Students are assigned to various industries, institutions, or agencies and work under joint supervision of supervisors and the course instructor. Participation in staff and internship conferences. Assigned readings and projects where appropriate. (Arrangements should be made one quarter in advance with the department.) Course may be repeated twice with permission of instructor and department chair. Normally a maximum of six units may be used for major department credit. Units in excess of five may be used for upper division elective credit. Offered on a credit, no-credit basis only. May be repeated for credit.

**CHEM 497 Cooperative Education (1–5)**

The Cooperative Education Program offers a sponsored learning experience in a work setting, integrated with a field analysis seminar. The field experience is contracted by the Cooperative Education Office on an individual basis, subject to approval by the department. The field experience, including the seminar and reading assignments, is supervised by the cooperative education coordinator and the faculty liaison (or course instructor) working with the field supervisor. Students are expected to enroll in the course for at least two quarters. The determination of course credits, evaluation, and grading are the responsibility of the departmental faculty. Offered on a credit, no-credit basis only. Department will determine application of credit.