CHEMISTRY (CHM)

CHM 100 - Fundamentals of General Chemistry (3.0 hours)
Core Curriculum: NS
Introduction to fundamental chemical concepts, including measurements; basic inorganic nomenclature; atomic structure; nuclear chemistry; periodic properties; molecular structure and bonding; basic thermochemistry; types of reactions; stoichiometry; properties of gases, liquids, solids, and solutions; equilibria; acids and bases. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry; not open to students with credit in CHM 110.
Prerequisite: Education majors, Engineering Technology majors, and allied health majors such as nursing and dietetics.

CHM 101 - Fundamentals of General Chemistry Lab (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in CHM 100. Topics include: measurements; stoichiometry; thermochemistry; molecular structure and bonding; properties of gases, liquids, solids, and solutions; acids and bases. Not open to students who are currently enrolled or have credit in CHM 111.
Prerequisite: CHM 100 or concurrent enrollment.

CHM 102 - Chemistry and Civilization (3.0 hours)
Core Curriculum: NS
A course for non-science majors that broadly surveys chemistry and its effects on civilization. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry.

CHM 104 - Essentials of General Chemistry (3.0 hours)
Core Curriculum: NS
This course is designed to prepare students for CHM 110 or to be utilized as a Bradley Core Curriculum course. Topics include: mathematical concepts used in General Chemistry; atomic structure; periodic properties; inorganic nomenclature; chemical reactions; stoichiometry; chemical bonding; basic thermochemistry. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry; not open to students with credit in CHM 110.
Prerequisite: Biochemistry, Chemistry, Biology, Biomedical Science, Computer Science, Kinesiology and Health Science, Engineering, Environmental Science, Medical Laboratory Science major, or consent of instructor; mathematics placement exam score is sufficient for placement in MTH 109.
Corequisite: MTH 109

CHM 110 - General Chemistry I (3.0 hours)
Core Curriculum: NS
Course designed to provide chemical concepts for students majoring in the physical or biological sciences, engineering, or related disciplines. Topics include: measurements; basic inorganic nomenclature; atomic structure; stoichiometry; types of reactions; thermochemistry; periodic properties; molecular structure and bonding; properties of gases, liquids, solids, and solutions; acids and bases.
Prerequisite: The mathematics placement exam score is sufficient for placement into MTH 115.; high school chemistry or C or better in CHM 100 or CHM 104.

CHM 111 - General Chemistry I Lab (1.0 hour)
Core Curriculum: NS
Laboratory that reinforces and expands upon concepts covered in CHM 110. Topics include: measurements; stoichiometry; spectrophotometry; thermochemistry; periodic properties; molecular structure and bonding; properties of gases, liquids, solids, and solutions; equilibria; acids and bases.
Prerequisite: CHM 110 or concurrent enrollment.

CHM 112 - Engineering Chemistry (3.0 hours)
Core Curriculum: NS
Continuation of CHM 110. For students majoring in engineering and related disciplines. Topics include: thermodynamics; equilibria; electrochemistry and corrosion; descriptive chemistry of metals and nonmetals; properties of metallic and silicon-based materials; organic and polymer chemistry; nuclear chemistry; environmental chemistry.
Prerequisite: C or better in CHM 110.

CHM 114 - Chemistry of the Elements (1.0 hour)
Continuation of CHM 110. For students majoring in Chemistry and Biochemistry and related disciplines. Topics include the chemistry of solids, nonmetals, and metal-containing compounds.
Prerequisite: C or better in CHM 110.

CHM 116 - General Chemistry II (3.0 hours)
Continuation of CHM 110. For students majoring in the physical or biological sciences and related disciplines. Topics include: acid-base equilibria; thermodynamics; electrochemistry; kinetics; nuclear chemistry; environmental chemistry.
Prerequisite: C or better in CHM 110.

CHM 117 - General Chemistry II Laboratory (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in CHM 116. Topics include: acid-base equilibria; spectrophotometry; complexation; electrochemistry; inorganic reaction chemistry.
Prerequisite: C or better in CHM 111; CHM 116 or concurrent enrollment.

CHM 122 - Introduction to Medical Laboratory Science (1.0 hour)
Overview of the medical laboratory science profession, including classroom instruction to introduce students to the clinical areas of hematology, clinical chemistry, diagnostic microbiology, immunohematology, serology, and phlebotomy. Scope of practice, career opportunities, and current issues along with a tour of a large hospital laboratory will be included.
Prerequisite: Medical Laboratory Science major, Biology major with Medical Technology concentration, or consent of program coordinator.

CHM 162 - Fundamentals of Organic and Biochemistry (3.0 hours)
Structure and reactivity of organic compounds as related to biochemistry. Structure, function, and metabolism of carbohydrates, lipids, and proteins. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry. Not open to students with credit in CHM 150 and CHM 160 or with credit in CHM 360.
Prerequisite: C or better in CHM 100, CHM 104, or CHM 110

CHM 163 - Fundamentals of Organic and Biochemistry Laboratory (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in CHM 162. Introduction to synthesis, purification and identification of organic compounds. Basic analytical techniques for the characterization of biologically important compounds such as amino acids, proteins, enzymes, and lipids. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry. Not open to students who have credit in CHM 361.
Prerequisite: CHM 162 or concurrent enrollment.

CHM 199 - Directed Studies in Chemistry and Biochemistry (0.0-3.0 hours)
Studies undertaken by first or second year students on a topic determined by the faculty member. Maximum of 3 hours per semester; repeatable for up to 6 hrs credit. Zero credit course graded Satisfactory/Unsatisfactory.
Prerequisite: Consent of instructor

CHM 250 - Concepts in Organic Chemistry (3.0 hours)
A one-semester in-depth coverage of conformational analysis, stereochemistry, reaction mechanisms, and spectroscopy for students considering careers in health-related professions. Students may not receive credit for both CHM 250 and CHM 252.
Prerequisite: CHM 116

CHM 252 - Organic Chemistry I (3.0 hours)
Systematic treatment of the structure, preparation, and properties of organic compounds, including the fundamental principles of stereochemistry and reaction mechanisms.
Prerequisite: C or better in CHM 116 and CHM 117

CHM 253 - Organic Chemistry Laboratory I (2.0 hours)
Laboratory to accompany CHM 252 emphasizing the synthesis, purification, and identification of organic compounds.
Prerequisite: Concurrent enrollment in CHM 252.

CHM 256 - Organic Chemistry II (3.0 hours)
Continuation of CHM 252.
Prerequisite: C or better in CHM 252.

CHM 257 - Organic Chemistry Laboratory II (1.0 hour)
Laboratory to accompany CHM 256.
Prerequisite: C or better in CHM 253 and concurrent enrollment in CHM 256.

CHM 283 - Laboratory Assistant (0.0 hours)
Core Curriculum: EL
Working under the direct supervision of a faculty mentor, students who participate as laboratory assistants have the opportunity to gain experience in laboratory preparation, maintenance, and instruction. Course may be repeated; course graded. Satisfactory/Unsatisfactory.
Prerequisite: CHM 110 and CHM 111.

CHM 299 - Directed Studies in Chemistry and Biochemistry (0.0-6.0 hours)
Core Curriculum: EL
Studies undertaken by freshman or sophomore students under the guidance of faculty mentors. Maximum of 3 hours per semester; repeatable for up to 6 hrs credit. At the completion of the semester, students are required to submit a research report, describing the goals, methods, and results of the study. Zero credit course graded Satisfactory/Unsatisfactory.
Prerequisite: C or better in CHM 110 and CHM 111; consent of instructor

CHM 301 - Societal Impacts of Chemistry (3.0 hours)
Core Curriculum: MI,NS
A course for non-science majors surveying the impacts and benefits of chemistry and related sciences for human society and the environment. May not be counted for credit in programs offered within the Department of Chemistry and Biochemistry.
Prerequisite: Junior Standing

CHM 302 - Medical Terminology (1.0 hour)
Terminology relevant to the medical and paramedical disciplines and interpreting typical medical reports.
Prerequisite: CHM 116 or 162 and BIO 111 or 151

CHM 320 - Quantitative Analysis (3.0 hours)
Introduction to modern analytical chemistry involving aqueous equilibrium chemistry, UV-vis and atomic spectroscopy, electrochemistry and chromatography.
Prerequisite: C or better in CHM 116 and CHM 117

CHM 321 - Quantitative Analysis Laboratory (1.0 hour)
Laboratory to accompany CHM 320 emphasizing aqueous equilibrium chemistry, spectroscopy, electrochemistry and chromatography.
Corequisite: CHM 320

CHM 360 - Biochemistry (3.0 hours)
Survey of the structural and functional properties of the major classes of biological macromolecules (proteins, nucleic acids, carbohydrates and lipids) and their roles in biological systems. Topics include enzyme kinetics and mechanisms, selected metabolic pathways, and the role of nucleic acids in the flow of genetic information.
Prerequisite: C or better in CHM 256; BIO 151 or BIO 111

CHM 361 - Biochemistry Laboratory (1.0 hour)
Core Curriculum: WI
Techniques and methods of macromolecular purification and characterization; refining skills of record collecting, data analysis, and presentation of results in manuscript form.
Prerequisite: C or better in CHM 253; CHM 360.

CHM 370 - Principles of Physical Chemistry (3.0 hours)
The course integrates fundamental concepts in thermodynamics, chemical kinetics, electrochemistry, quantum chemistry and molecular spectroscopy essential to understanding, explaining, predicting, and rationalizing the experimental behavior chemical/biochemical processes.
Prerequisite: Grade of C or better in CHM 256, Grade of C or better in MTH 115 or MTH 121, Grade of C or better in PHY 107 or PHY 110

CHM 380 - Junior Seminar in Chemistry and Biochemistry (1.0 hour)
Students attend and write summaries of weekly seminars pertaining to all aspects of Chemistry. Course graded Satisfactory/Unsatisfactory.
Prerequisite: CHM 256

CHM 400 - Chemical Topics (1.0-3.0 hours)
Topic stated in the current Schedule of Classes. Maximum of 3 credit hours per semester; may be repeated under different topics for a maximum of six credit hours. Cross-listed with CHM 500.
Prerequisite: C or better in CHM 256

CHM 412 - Molecular Modeling (1.0 hour)
An introduction to computational chemistry with an emphasis on the structures and energies of organic systems. Cross listed with CHM 512.
Prerequisite: C or better in CHM 256.

CHM 414 - Chemical Group Theory (1.0 hour)
Application of symmetry and group theory to chemical systems. Topics include point groups, character tables, spectroscopic selection rules, and molecular orbital theory. Cross listed with CHM 514.
Prerequisite: C or better in CHM 256.

CHM 416 - Environmental Chemistry (3.0 hours)
Chemical principles applied to environmental topics such as air, water, soils, and conventional and hazardous wastes. Thermodynamic and kinetic principles, acid-base and redox chemistry, interfacial chemistry and analytical techniques. Cross-listed with CHM 516.
Prerequisite: C or better in CHM 112 or CHM 116.

CHM 417 - Experimental Design Laboratory (1.0 hour)
Students will work under the guidance of the instructor to design and implement laboratory solutions to chemical problems. Students will analyze data, draw conclusions, and communicate the results in a written and/or oral report.
Prerequisite: CHM 320 and CHM 321

CHM 420 - Instrumental Analysis (4.0 hours)
Theory and applications of qualitative and quantitative instrumental methods of chemical analysis. Includes laboratory; cross listed with CHM 520.
Prerequisite: C or better in CHM 257, CHM 320 and CHM 321.

CHM 422 - Clinical Chemistry (2.0 hours)
Diagnostic laboratory testing methods in a variety of areas, including endocrinology, enzymes, acid-base balance, carbohydrates, and lipids. Cross listed with CHM 522.
Prerequisite: CHM 256.

CHM 436 - Inorganic Chemistry (3.0 hours)
Theoretical and descriptive inorganic chemistry, including atomic structure, molecular structure, coordination chemistry, organometallic chemistry, and catalysis. Cross listed with CHM 536.
Prerequisite: C or better in CHM 114 or concurrent enrollment; C or better in CHM 256.

CHM 440 - Materials Chemistry (3.0 hours)
Study of unit cells, band theory, and the structure, function, and characterization (diffraction, microscopy, and spectroscopy) of metals, polymers, glasses, concrete, ceramics, and biomaterials. Cross listed with CHM 540.
Prerequisite: C or better in CHM 256 and CHM 257 or consent of instructor.

CHM 441 - Materials Chemistry Laboratory (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in CHM 440. Emphasis on methods of fabrication and characterization of various types of materials. Cross listed with CHM 541.
Prerequisite: C or better in CHM 440 or CHM 540 or concurrent enrollment.

CHM 462 - Protein Structure and Function (3.0 hours)
Investigation of the structure-function relationships of proteins, with emphasis on thermodynamics and kinetics. Topics include ligand binding, enzymatic catalysis, and the use of molecular visualization software. Cross listed with CHM 562.
Prerequisite: C or better in CHM 360.

CHM 466 - Intermediary Metabolism (3.0 hours)
Study of the processes by which carbohydrates, lipids, proteins, and nucleic acids are synthesized, stored, or oxidized to generate biochemical energy and building blocks. Regulation of these processes will be examined. Cross listed with CHM 566.
Prerequisite: C or better in CHM 360.

CHM 470 - Physical Chemistry I (3.0 hours)
Topics include kinetic molecular theory, thermodynamics, equilibrium, and kinetics. Cross listed with CHM 570. It is recommended that students take CHM 326 before taking this course
Prerequisite: Grade of C or better in: CHM 116 and CHM 256; MTH 116 or MTH 122; PHY 108 or PHY 201

CHM 471 - Physical Chemistry Laboratory (1.0 hour)
Core Curriculum: WI
Experimental and computational studies of the physical properties of matter. Cross listed with CHM 571.
Prerequisite: C or better in CHM 370 or CHM 470, or concurrent enrollment in CHM 370 or CHM 470.

CHM 476 - Physical Chemistry II (3.0 hours)
Topics include quantum mechanics, spectroscopy, and statistical thermodynamics. Cross listed with CHM 576. It is recommended that students take CHM 326 before taking this course.
Prerequisite: Grade of C or better in: CHM 116 and CHM 256; MTH 116 or MTH 122; PHY 108 or PHY 201

CHM 480 - Senior Seminar in Chemistry and Biochemistry (1.0 hour)
Each student presents a seminar under the supervision of a faculty member.
Prerequisite: CHM 380

CHM 499 - Directed Studies in Chemistry and Biochemistry (0.0-3.0 hours)
Core Curriculum: EL
Studies undertaken by advanced students under the guidance of faculty mentors. Maximum of 3 hours per semester; repeatable for up to 6 hours credit. At the completion of the semester, students are required to submit a research report describing the goals, methods, and results of the study. Zero credit course graded Satisfactory/Unsatisfactory.
Prerequisite: C or better in CHM 252 and CHM 253; consent of instructor

CHM 500 - Chemical Topics (1.0-3.0 hours)
Topic stated in the current Schedule of Classes. Maximum of 3 credit hours per semester; may be repeated under different topics for a maximum of six credit hours. Cross-listed with CHM 400.
Prerequisite: C or better in CHM 256.

CHM 512 - Molecular Modeling (1.0 hour)
An introduction to computational chemistry with an emphasis on the structures and energies of organic systems. Cross listed with CHM 412. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 256.

CHM 514 - Chemical Group Theory (1.0 hour)
Application of symmetry and group theory to chemical systems. Topics include point groups, character tables, spectroscopic selection rules, and molecular orbital theory. Cross listed with CHM 414. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 256.

CHM 516 - Environmental Chemistry (3.0 hours)
Chemical principles applied to environmental topics such as air, water, soils, and conventional and hazardous wastes. Thermodynamic and kinetic principles, acid-base and redox chemistry, interfacial chemistry and analytical techniques are included. Cross-listed with CHM 416. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 112 or CHM 116.

CHM 520 - Instrumental Analysis (4.0 hours)
Theory and applications of qualitative and quantitative instrumental methods of chemical analysis. Includes laboratory. Cross listed with CHM 420. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 257 and CHM 320 and CHM 321.

CHM 522 - Clinical Chemistry (2.0 hours)
Diagnostic laboratory testing methods in a variety of areas, including endocrinology, enzymes, acid-base balance, carbohydrates, and lipids. Not open to students with credit in CHM 422.
Prerequisite: CHM 162

CHM 524 - Fundamentals of Separation Science (3.0 hours)
The theory and practice of separation methods used in the analytical chemistry of chemical and biochemical systems are covered. Traditional separation methods such as extraction, precipitation, and crystallization are introduced. These techniques are compared and contrasted with chromatographic methods of separation that make up the bulk of the topics covered. Chromatographic theory and its practical application in the form of specific analytical separation methods are discussed.
Prerequisite: CHM 320 or CHM 420 or CHM 470

CHM 526 - Advanced Analytical Chemistry (3.0 hours)
Instrumental analysis, including topics in spectroscopy, electrochemistry, chromatography, sampling, and statistics.
Prerequisite: C or better in CHM 420 or CHM 520.

CHM 536 - Inorganic Chemistry (3.0 hours)
Theoretical and descriptive inorganic chemistry, including atomic structure, molecular structure, coordination chemistry, organometallic chemistry, and catalysis. Cross listed with CHM 436. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 114 or concurrent enrollment; C or better in CHM 256.

CHM 540 - Materials Chemistry (3.0 hours)
Study of unit cells, band theory, and the structure, function, and characterization (diffraction, microscopy, and spectroscopy) of metals, polymers, glasses, concrete, ceramics, and biomaterials. Cross listed with CHM 440. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 256 and CHM 257 or consent of instructor.

CHM 541 - Materials Chemistry Laboratory (1.0 hour)
Laboratory that reinforces and expands upon concepts covered in CHM 440/540. Emphasis on methods of fabrication and characterization of various types of materials. Cross listed with CHM 441. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 440 or CHM 540 or concurrent enrollment.

CHM 552 - Advanced Organic Chemistry (3.0 hours)
Topics include principles of physical organic chemistry, organometallic chemistry, and stereo- and regiochemical control in organic synthesis.
Prerequisite: CHM 256 and CHM 257.

CHM 558 - Topics in Organic Chemistry (1.0-6.0 hours)
Topic stated in the current Schedule of Classes. Maximum of 3 hours per semester; may be repeated under different topics for a maximum of six credits.
Prerequisite: Consent of instructor.

CHM 560 - Principles of Biochemistry (3.0 hours)
Survey of the structural and functional properties of the major classes of biological macromolecules (proteins, nucleic acids, carbohydrates and lipids) and their roles in biological systems. Topics include enzyme kinetics and mechanisms, selected metabolic pathways, and the role of nucleic acids in the flow of genetic information.
Prerequisite: Graduate standing and consent of instructor.

CHM 561 - Principles of Biochemistry Laboratory (1.0 hour)
Techniques and methods of macromolecular purification and characterization; refining skills of record collecting, data analysis, and presentation of results in manuscript form.
Prerequisite: C or better in CHM 360 or CHM 560

CHM 562 - Protein Structure and Function (3.0 hours)
Investigation of the structure-function relationships of proteins, with emphasis on thermodynamics and kinetics. Topics include ligand binding, enzymatic catalysis, and the use of molecular visualization software. Cross listed with CHM 462. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 360 or equivalent.

CHM 564 - Biochemical Literature (1.0-2.0 hours)
Designed to foster students' ability to read and critically evaluate biochemistry papers from the primary literature. In addition, students will gain experience in giving oral presentations and writing critical summaries of the papers they present.
Prerequisite: C or better in CHM 360 and consent of instructor.

CHM 566 - Intermediary Metabolism (3.0 hours)
Study of the processes by which carbohydrates, lipids, proteins, and nucleic acids are synthesized, stored, or oxidized to generate biochemical energy and building blocks. Regulation of these processes will be examined. Cross listed with CHM 466. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 360 or equivalent.

CHM 568 - Selected Topics in Biochemistry (1.0-3.0 hours)
Topic stated in the current Schedule of Classes. Maximum of 3 hours per semester; may be repeated under different topics for a maximum of six credits.
Prerequisite: consent of instructor.

CHM 570 - Physical Chemistry I (3.0 hours)
Topics include kinetic molecular theory, thermodynamics, equilibrium, and kinetics. Students conduct independent projects. Cross listed with CHM 470. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: Grade of C or better in: CHM 116 and CHM 256; MTH 116 or MTH 122; PHY 108 or PHY 201

CHM 571 - Physical Chemistry Laboratory (1.0 hour)
Experimental and computational studies of the physical properties of matter. Cross listed with CHM 471. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: C or better in CHM 470 or concurrent enrollment in CHM 570.

CHM 576 - Physical Chemistry II (3.0 hours)
Topics include quantum mechanics, spectroscopy, and statistical thermodynamics. Students conduct independent projects. Cross listed with CHM 476. For cross-listed undergraduate/graduate courses, the graduate-level course will have additional academic requirements beyond those of the undergraduate course.
Prerequisite: Grade of C or better in: CHM 116 and CHM 256; MTH 116 or MTH 122; PHY 108 or PHY 201

CHM 580 - Literature Seminar in Chemistry & Biochemistry (1.0 hour)
Each student presents a literature-based seminar under the supervision of a faculty member.
Prerequisite: consent of instructor.

CHM 584 - Readings in Chemistry and Biochemistry (1.0-6.0 hours)
Directed reading for qualified students. Maximum of 3 hours per semester; repeatable for up to 6 hrs credit.
Prerequisite: consent of instructor.

CHM 599 - Research (0.0-8.0 hours)
Core Curriculum: EL
Research in an area of interest to the student, repeatable for up to 8 hours credit. At the completion of the semester, students are required to submit a research report, describing the goals, methods, and results of the study. Zero-credit course graded. Satisfactory/Unsatisfactory.

CHM 686 - Literature Review (1.0 hour)
Each student will prepare a concise, up-to-date, well-written review paper and present a seminar to the Department on a literature topic that is chosen in consultation with the course instructor and the student's academic advisor.
Prerequisite: Consent of instructor

CHM 697 - Research (0.0-10.0 hours)
Research in an area of chemistry or biochemistry of interest to the student, repeatable for up to 10 hours credit. At the completion of the semester, students are required to submit a research report, giving an update of the progress made in their research. Zero credit course graded Satisfactory/Unsatisfactory.
Prerequisite: Consent of instructor

CHM 699 - Thesis (0.0-1.0 hours)
All MS students must write a thesis based on independent research and present a public seminar detailing the accomplishments of his/her thesis research. The final version of thesis must conform to the requirements outlined by the department and on the Graduate School website. Typically, students enroll in the course in the semester they intend to submit their thesis. Zero credit course graded Satisfactory/Unsatisfactory.
Prerequisite: 6 hours of CHM 697 with grades of B or better.