The courses offered by this Department are designed to serve the needs of three distinct groups of students:

1. those majoring in chemistry with the intention of entering the chemical profession,
2. those majoring in chemistry with the intention of entering other professional fields, and
3. those majoring in other subjects who desire to elect chemistry courses as part of their programs. Students intending to major in chemistry should refer to the program tabs for more information.

Students with no prior experience in chemistry may elect CHM 1000 (for non-science majors); CHM 1020 (for non-science majors and certain preprofessional students); or CHM 1040, which is intended for students who need higher-level chemistry work but who fail to qualify for CHM 1220 or CHM 1225 or whose math/science skills are weak. Students who have a year or more of high school chemistry or the equivalent may register for CHM 1220 or CHM 1225 (for science and preprofessional majors) provided that they meet the other eligibility requirements outlined below. Election of CHM 1000, CHM 1020, CHM 1220, or CHM 1225 will satisfy the University General Education Requirement for a physical science.

Terminal Chemistry Courses: CHM 1000 is a terminal survey course designed primarily to acquaint non-science students with the principles of chemistry in a format requiring minimal mathematical skills. When elected for four credits, this course includes a laboratory which satisfies the University General Education Requirement for a laboratory course.

CHM 1020 and CHM 1030 represent a terminal sequence designed to introduce the basic principles of chemistry and survey the various fields of chemistry for non-science majors and certain pre-professional students such as pre-nursing, occupational health, engineering technicians and others.

Foundational Chemistry: CHM 1040 is designed as the beginning chemistry course for science majors, pre-professional students, and other students who have had little prior experience in chemistry and/or mathematics. CHM 1220 (or CHM 1225) and CHM 1230 are complementary and corequisite courses which should be taken during the same term. CHM 1220 is a classroom-focused course. CHM 1230 is a laboratory-focused course. This also describes the succeeding corequisite sets CHM 1240 and CHM 1250, CHM 2220 and CHM 2230, and CHM 2280 and CHM 2290.

General Chemistry: CHM 1220/CHM 1230 are designed as the beginning courses for science majors and preprofessional students who have a good background in high school chemistry. (CHM 1225/CHM 1230 is the sequence for students in the College of Engineering.) Eligibility for CHM 1220/CHM 1230 must be established by passing a placement examination, covering basic high school material, which is administered by Testing, Evaluation, and Student Life Research, 698 Student Center Building. The qualifying examination is administered several times prior to and during registration.

The sequence of CHM 1220/CHM 1230 and CHM 1240/CHM 1250 are prerequisite to all higher numbered courses in chemistry.

Advanced Placement Credit

Advanced placement college credit in chemistry shall be awarded for scores earned in the chemistry placement examination as follows:

1. Score of 4 or 5: Credit awarded for CHM 1220/CHM 1230 and CHM 2280 (eight credits); student is eligible to enroll in CHM 1240/CHM 1250.
2. Score of 3: Credit awarded for CHM 1220/CHM 1230 (five credits); student is eligible to enroll in CHM 1240/CHM 1250.

AHN, YOUNG-HOON: Ph.D., New York University; B.S., Pohang University Science and Technology; Associate Professor

ALLEN, MATHEW: Ph.D., California Institute of Technology; B.S., Purdue University; Professor and Chair

BHAGWAT, ASHOK S.: Ph.D., Pennsylvania State University; M.S., Indian Institute of Technology; B.A., University of Bombay; Professor

BROCK, STEPHANIE L.: Ph.D., University of California, Davis; B.S., University of Washington; Professor

CHA, JIN K.: Ph.D., University of Oxford; B.S., Seoul National University; Professor

CHEKMENEV, EDUARD: Ph.D., University of Louisville; B.S., Perm State University; Associate Professor

CHERNYAK, VLADIMIR: Ph.D., Russian Academy of Science, Institute of Spectroscopy; M.S., Moscow Physics and Technology Institute; Professor

CHOW, CHRISTINE: Ph.D., California Institute of Technology; M.A., Columbia University; B.A., Bowdoin College; Professor

CRICH, DAVID: Des Sciences, Université de Paris XI; B.S., University of Surrey; Professor

ENDICOTT, JOHN F.: Ph.D., Johns Hopkins University; B.A., Reed College; Professor Emeritus

FEHL, CHARLIE: Ph.D., University of Kansas; B.S., University of Michigan; Assistant Professor

FEIG, ANDREW: Ph.D., Massachusetts Institute of Technology; B.S., Yale University; Professor

GROYSMAN, STANISLAV: Ph.D., B.S., Tel Aviv University; Associate Professor

HENDRICKSON, TAMARA: Ph.D., California Institute of Technology; B.A., Wellesley College; Associate Professor

KODANKO, JEREMY: Ph.D., University of California at Irvine; B.S., University Wisconsin, Madison; Associate Professor and Associate Chair

LI, WEN: Ph.D., Stony Brook University; B.S., Peking University; Associate Professor

LINTVEDT, RICHARD L.: Ph.D., University of Nebraska; B.A., Lawrence University; Professor Emeritus

LINZ, THOMAS H.: Ph.D., University of Kansas; B.S., Truman State University; Assistant Professor

LIU, ZHENFEI: Ph.D., University of California at Irvine; B.S., Peking University; Assistant Professor

LONG, LUO: Ph.D., University of Utah; B.S., Beijing University of Aeronautics and Astronautics; Assistant Professor
MATTI, ANDREA: Ph.D., Michigan State University; B.S., Madonna University; Senior Lecturer

NGUYEN, HIEN: Ph.D., University of Illinois at Urbana-Champaign; B.S., Tufts University; Assistant Professor

PFLUM, MARY KAY H.: Ph.D., Yale University; B.A., Carleton College; Professor

POOLE, COLIN F.: Ph.D., Keele University; M.Sc., Bristol University; B.Sc., Leeds University; Professor

RABUFFETTI, FEDERICO A.: Ph.D., Northwestern University; B.Sc., Universidad de la Republica; Assistant Professor

RIGBY, JAMES H.: Ph.D., University of Wisconsin; B.S., Case Western Reserve University; Professor Emeritus

RIGBY, JAMES H.: Ph.D., University of Wisconsin; B.S., Case Western Reserve University; Professor Emeritus

RUDY, AARON: Ph.D., University of Michigan; B.S., University of Illinois at Urbana-Champaign; Assistant Professor

SANTA LUCIA, JOHN: Ph.D., University of Rochester; B.S., Clarkson University; Professor Emeritus

SCHLEGEL, H. BERNHARD: Ph.D., Queen’s University; B.Sc., University of Waterloo; Professor

STOCKDILL, JENNIFER L.: Ph.D., California Institute of Technology; B.S., Virginia Polytechnic Institute and State University; Assistant Professor

TRIMPIN, SARAH: Doktor der Naturwissenschaften, Max-Planck-Institut for Polymer Research, University of Mainz; Vor-Diplom, Diplom, University of Konstanz; Professor

VERANI, CLAUDIO N.: Ph.D, Max-Planck-Institut für Strahlenchemie und Ruhr-Universität; M.Sc., B.S., Universidade Federal de Santa Catarina; Professor

WINTER, CHARLES H.: Ph.D., University of Minnesota; B.S., Hope College; Professor

ZIBUCK, REGINA: Ph.D, University of Pennsylvania; M.S., B.S., Bucknell University; Associate Professor (Research)

CHM 1000 Chemistry and Your World Cr. 4
Satisfies General Education Requirement: Natural Scientific Inquiry, Physical Sciences
Facts and theories from analytical, inorganic, organic, and physical chemistry, and from biochemistry; their consequences in life processes and the environment. Meets General Education Laboratory Requirement when elected for 4 credits. Offered Fall, Winter.
Course Material Fees: $110

CHM 1020 Survey of General Chemistry Cr. 4
Satisfies General Education Requirement: Natural Scientific Inquiry, Physical Sciences
High school chemistry not required. First course in the terminal sequence consisting of CHM 1020 and CHM 1030. Matter and energy in chemistry, chemical symbols and equations, structure and properties of atoms, introduction to chemical bonding; periodicity in chemistry, solids, liquids, gases, solutions, acids and bases, and equilibrium. Meets General Education Laboratory Requirement. Offered Fall, Winter.
Prerequisites: Math Permit to Reg - L1-L4 with a test score minimum of 2-4 or MAT 0993-6XXX with a minimum grade of C or MAT Permit to Reg ACT/SAT with a test score minimum of 2-4 or ACT Math with a test score minimum of 18-36 or SAT Mathematics with a test score minimum of 490-800 or SAT MATH POST-2016 with a test score minimum of 490-800
Course Material Fees: $110

CHM 1030 Survey of Organic/Biochemistry Cr. 4
Organic and biological chemistry; brief introduction to organic chemistry, emphasizing classes of compounds important in biochemical processes; survey of biochemistry with applications to nutrition, physiology, and clinical chemistry; protein structure; intermediary metabolism; molecular biology; and metabolic regulation. Offered Winter.
Course Material Fees: $110

CHM 1040 Chemistry Skills and Reasoning Cr. 4
Reasoning and mathematical skills needed for development of a scientific approach in chemistry. No credit if taken after any other chemistry course. Offered Fall, Winter.
Prerequisites: Math Permit to Reg - L1-L4 with a test score minimum of 2-4 or MAT 0993-6XXX with a minimum grade of C or MAT Permit to Reg ACT/SAT with a test score minimum of 2-4 or ACT Math with a test score minimum of 21-36 or SAT Mathematics with a test score minimum of 510-800 or SAT MATH POST-2016 with a test score minimum of 510-800

CHM 1220 General Chemistry I Cr. 4
Satisfies General Education Requirement: Natural Scientific Inquiry, Physical Sciences
Introduction to the principles of chemistry for students with high school background in chemistry. Chemical structure, bonding, and reactivity. Satisfies General Education laboratory requirement upon completion of both CHM 1220 and 1230. Only two credits if taken after CHM 1020. No credit after if taken after CHM 1225. Offered Every Term.
Prerequisites: CHM 1040 with a minimum grade of C- or CHM Permit to Reg L1-L3 CPE with a test score minimum of 2-3 or CHM 1020 with a minimum grade of C- and Math Permit to Reg - L1-L4 with a test score minimum of 3-4 or MAT Permit to Reg ACT/SAT with a test score minimum of 3-4 or MAT 1050 with a minimum grade of C- or MAT 1800-6ZZZ
Equivalent: CHM 1225
CHM 1225 General Chemistry I for Engineers Cr. 3
Satisfies General Education Requirement: Natural Scientific Inquiry, Physical Sciences
Introduction to principles of chemistry for students with high school background in chemistry. Chemical structure, bonding, and reactivity. Satisfies General Education laboratory requirement upon completion of both CHM 1225 and 1230. Only one credit after CHM 1020. No credit after CHM 1220. Offered Every Term.
Prerequisites: CHM 1040 with a minimum grade of C- or CHM Permit to Reg L1-L3 CPE with a test score minimum of 2-4 or CHM 1020 with a minimum grade of C- and Math Permit to Reg - L1-L4 with a test score minimum of 3-4 or MAT Permit to Reg ACT/SAT with a test score minimum of 3-4 or May be taken concurrently: MAT 1800-62ZZZ with a minimum grade of C-
Restriction(s): Enrollment limited to students in the College of Engineering.
Equivalent: CHM 1220

CHM 1230 General Chemistry I Laboratory Cr. 1
Laboratory course to introduce the scientific method, properties of materials, the role of energy, structure and spectroscopy. Satisfaction of General Education lab requirement is awarded only upon successful completion of both the prereq./coreq. course and this lab course. Offered Every Term.
Prerequisites: May be taken concurrently: CHM 1220 with a minimum grade of C- or CHM 1225 with a minimum grade of C-
Course Material Fees: $110

CHM 1240 Organic Chemistry I Cr. 4
Introductory organic chemistry combined with the general principles of chemistry. Carbon compounds and chemical bonding, acid-based chemistry, stereochemistry and introductory organic reactions. Offered Every Term.
Prerequisites: CHM 1050 with a minimum grade of C- or CHM 1070 with a minimum grade of C- or CHM 1220 with a minimum grade of C- and CHM 1230 with a minimum grade of C- or CHM 1225 with a minimum grade of C-

CHM 1250 Organic Chemistry I Laboratory Cr. 1
Integrated general/organic chemistry laboratory focusing on spectroscopy, acid-based chemistry, molecular modeling and organic reactions as well as some attention to chromatography. Offered Every Term.
Course Material Fees: $110

CHM 1240 Chemical Principles II: Organic Chemistry Cr. 6
Accelerated approach to organic/bio-organic chemistry. Offered Intermittently.
Course Material Fees: $110

CHM 2220 Organic Chemistry II Cr. 4
Organic reactions of functional groups such as aldehydes, ketones and related carbonyl compounds. Extensive discussion of the interface of organic/biochemistry and bioinorganic chemistry. No credit after if taken after CHM 2225. Offered Every Term.
Prerequisites: CHM 2240 with a minimum grade of C- or CHM 1240 with a minimum grade of C- and CHM 1250 with a minimum grade of C-

CHM 2225 Organic Chemistry II for Engineers Cr. 3
Organic reactions of functional groups such as aldehydes, ketones and related carbonyl compounds. Extensive discussion of the interface of organic/biochemistry and bioinorganic chemistry. No credit after if taken after CHM 2220. Offered Every Term.
Prerequisites: CHM 1240 with a minimum grade of C- and CHM 1250 with a minimum grade of C-
Restriction(s): Enrollment is limited to Undergraduate level students; enrollment limited to students in the College of Engineering.

CHM 2230 Organic Chemistry II Laboratory Cr. 1
Synthesis of organic and bio-organic compounds. Offered Every Term.
Prerequisites: May be taken concurrently: CHM 2220 with a minimum grade of C- or CHM 2225 with a minimum grade of C-
Course Material Fees: $110

CHM 2280 General Chemistry II: Analytical Chemistry Cr. 3
Concepts and calculations regarding kinetics, equilibrium, thermodynamics for a variety of reaction types. Qualitative and quantitative examples and applications. Offered Every Term.
Prerequisites: CHM 1410 with a minimum grade of C- or CHM 2240 with a minimum grade of C- or CHM 1240 with a minimum grade of C- and CHM 1250 with a minimum grade of C-

CHM 2290 General Chemistry II: Analytical Chemistry Laboratory Cr. 2
Study and use of acid-base redox, solubility precipitation, and complex forming reactions and equilibria in qualitative and quantitative chemistry. Offered Every Term.
Prerequisites: May be taken concurrently: CHM 2280 with a minimum grade of C-
Course Material Fees: $110

CHM 2999 Honors Research Problems in Chemistry Cr. 2-4
Research projects under the direction of a senior faculty member. Offered Every Term.
Prerequisites: CHM 1240 with a minimum grade of C and CHM 1250 with a minimum grade of C or CHM 1410 with a minimum grade of C

CHM 3000 Metals in Biology Cr. 3
Descriptive approach to metals involved in biological systems. Offered Fall.
Prerequisites: CHM 1240 with a minimum grade of C

CHM 3020 Intermediate Inorganic Chemistry I Cr. 3
Emphasizes chemistry of the main group elements and includes basic coordination chemistry of the transition metals. Offered Winter.
Prerequisites: CHM 1240 with a minimum grade of C

CHM 4850 Frontiers in Chemistry Cr. 1
Fields of fundamental chemistry now under investigation, presented by invited specialists actively engaged in research. Offered Fall, Winter.
Restriction(s): Enrollment is limited to students with a major in Chemistry or Chemistry Honors; enrollment limited to students in a BS in Chemistry or Bachelor of Arts degrees.
Repeatable for 2 Credits

CHM 5020 Intermediate Inorganic Chemistry II Cr. 3
Transition metal chemistry. Coordination compounds and organometallics. Bonding theories and reactivity. Synthesis, purification, and characterization of inorganic compounds with an emphasis on transition metal compounds. Offered Fall.
Prerequisites: CHM 6070 with a minimum grade of C or CHM 3020 with a minimum grade of C and CHM 5400-5440 with a minimum grade of C

CHM 5160 Instrumental Analytical Chemistry Cr. 3
Prerequisites: CHM 5400 with a minimum grade of C or CHM 5420 with a minimum grade of C or CHM 5440 with a minimum grade of C and PHY 2180 with a minimum grade of C
CHM 5400 Biological Physical Chemistry Cr. 4
Presentation of physical chemistry topics: thermodynamics, solution equilibria, chemical kinetics, quantum chemistry, spectroscopy, statistical mechanics, transport processes, and structure with biological applications. Offered Winter.
Prerequisites: CHM 2280 with a minimum grade of C and MAT 2020 with a minimum grade of C and May be taken concurrently: MAT 2030 with a minimum grade of C and May be taken concurrently: PHY 2170 with a minimum grade of C

CHM 5420 Physical Chemistry I Cr. 3
Chemical thermodynamics, phase equilibrium, solutions, surface chemistry, electrochemistry. Only two credits applicable toward degree after CHM 5400. Offered Fall.
Prerequisites: CHM 2280 with a minimum grade of C and MAT 2020 with a minimum grade of C and May be taken concurrently: MAT 2030 with a minimum grade of C and May be taken concurrently: PHY 2170 with a minimum grade of C

CHM 5440 Physical Chemistry II Cr. 4
Kinetic theory, empirical and theoretical kinetics, quantum theory, atomic and molecular structure, molecular spectroscopy, statistical mechanics. Only three credits applicable to degree after CHM 5400. Offered Winter.
Prerequisites: CHM 2280 with a minimum grade of C and MAT 2020 with a minimum grade of C and May be taken concurrently: MAT 2030 with a minimum grade of C and May be taken concurrently: PHY 2170 with a minimum grade of C

CHM 5510 Chemical Synthesis Laboratory Cr. 3
Advanced techniques for the synthesis, purification and characterization of organic compounds. Offered Fall.
Prerequisites: CHM 1420 with a minimum grade of C or CHM 2220 with a minimum grade of C and CHM 2230 with a minimum grade of C
Course Material Fees: $110

CHM 5550 Physical Chemistry Laboratory Cr. 2
Satisfies General Education Requirement: Writing Intensive Competency
Prerequisites: May be taken concurrently: CHM 5400 with a minimum grade of C or CHM 5420 with a minimum grade of C or CHM 5440 with a minimum grade of C and PHY 2180 with a minimum grade of C
Course Material Fees: $110

CHM 5570 Instrumental Analytical Chemistry Laboratory Cr. 3
Lecture and laboratory experiments covering electronics, measurement, and instrumentation. Principles and analytical applications of electrochemistry, chromatography, and spectroscopy including UV-visible, IR, magnetic resonance, and mass spectroscopy. Offered Winter.
Prerequisites: CHM 5160 with a minimum grade of C
Course Material Fees: $110

CHM 5600 Survey of Biochemistry Cr. 3
Prerequisites: CHM 1420 with a minimum grade of C or CHM 2220 with a minimum grade of C or CHM 2225 with a minimum grade of C

CHM 5900 Biomedical Research as Discovery Cr. 2
Solving biochemical research problems using laboratory research tools including computational methods. Offered Yearly.
Prerequisites: CHM 6610 with a minimum grade of C and CHM 6620 with a minimum grade of C

CHM 5998 Honors Thesis Research in Chemistry Cr. 2-4
Original investigation under direction of senior staff member. Submission of B.S. thesis or manuscript in publication format. Presentation of public lecture on B.S. research. Offered Every Term.
Restriction(s): Enrollment is limited to students with a major in Biochem & Chem Bio Honors or Chemistry Honors.
Repeatable for 8 Credits

CHM 6060 Materials Chemistry and Engineering Cr. 3
Prerequisites: CHM 3020 with a minimum grade of C

CHM 6070 Advanced Bioorganic Chemistry Cr. 3
Applications of inorganic chemistry principles to understanding biological systems including metalloenzymes. Offered Winter.
Prerequisite: CHM 3000 with a minimum grade of C

CHM 6090 Organometallic Chemistry Cr. 3
Models and Applications of the Organometallic Chemistry of the Transition Metals including Activation of Small Molecules and Bioorganometallics. Offered Winter.
Prerequisite: CHM 5020 with a minimum grade of C

CHM 6170 Advances in Bioanalytical Chemistry Cr. 3
How analytical methods are used to obtain information regarding biological systems. Offered Intermittently.
Prerequisite: CHM 5160 with a minimum grade of C

CHM 6240 Organic Spectroscopy Cr. 3
Application of IR, NMR, UV, and mass spectrometry to the identification of organic compounds. Emphasis on interpretation of spectra, especially NMR. Recommended for students intending to do graduate or industrial work in organic chemistry. Offered Winter.
Prerequisite: CHM 1420 with a minimum grade of C or CHM 2220 with a minimum grade of C

CHM 6270 Advanced Bioorganic Chemistry and Drug Design Cr. 3
Studies of biological problems using organic synthetic methods and applications to drug design. Offered Fall.
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6440 Computational Chemistry Cr. 3
Aspects of computational chemistry pertinent to effective use of molecular modeling techniques. Molecular mechanics, semi-empirical and ab initio calculations, molecular dynamics. Offered Intermittently.
Prerequisite: CHM 5440 with a minimum grade of C
Course Material Fees: $95

CHM 6570 Computational Biochemistry and Bioinformatics Cr. 3
Application of computational and molecular modeling software tools to biochemical problems. Offered Intermittently.
Prerequisite: CHM 5400 with a minimum grade of C
CHM 6610 Biological Chemistry Laboratory Cr. 3
Satisfies General Education Requirement: Writing Intensive Competency
Basic experiments in isolation, purification, and analysis of biomolecules.
Techniques currently used in molecular biology and recombinant DNA procedures stressed. Offered Fall, Winter.
Prerequisite: CHM 6620 with a minimum grade of C
Restriction(s): Enrollment is limited to students with a major in Biochem & Chem Bio Honors, Biochem & Chemical Biology, Chemistry or Chemistry Honors.
Course Material Fees: $110

CHM 6620 Metabolism: Pathways and Regulation Cr. 3
Major metabolic pathways of carbohydrate, fatty acid, amino acid, and nucleotide synthesis and degradation. Pathways and mechanisms of energy generation. Hormonal and allosteric regulation of enzyme activity. Offered Fall.
Prerequisites: CHM 2220 with a minimum grade of C

CHM 6635 Tools of Molecular Biology Cr. 3
Principles underlying genetic and biochemical methods; complements work in lab CHM 6610. Offered Winter.
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6640 Molecular Biology Cr. 3
Prerequisite: CHM 6620 with a minimum grade of C

CHM 6740 Laboratory Safety Cr. 1-2
Discussion and demonstration of safe laboratory practice. Use, storage and disposal of ordinary and hazardous substances; personal protection devices; regulations and codes. Required for all graduate degrees in chemistry. Not for chemistry major credit Offered Fall, Winter.

CHM 6990 Directed Study Cr. 1-4
Offered Every Term.
Repeatable for 8 Credits

CHM 6991 Internship in Chemistry Cr. 1
Practical research experience through visiting a university, industry, or national laboratory. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students; enrollment is limited to students with a major in Chemistry.
Repeatable for 2 Credits