871 Material Surfaces and Interfaces
Fall of odd years. 3(3-0) Interdepartmental with Materials Science and Mechanics. Administered by Department of Materials Science and Mechanics. P:NM: (CEM 362 or MSM 351) R: Open only to graduate students in the Department of Chemical Engineering or Department of Chemistry or Department of Materials Science and Mechanics or School of Packaging. Physical and chemical nature of solid surfaces and their interaction with gases, liquids, and other solids. Characterization of surfaces and solid-solid interfaces. Relation of surface and interfacial structure to engineering phenomena.

872 Polymers and Composites: Manufacturing, Structure and Performance
Spring of even years. 3(3-0) R: Open only to graduate students in the College of Engineering or the Department of Chemistry. Structure-Property Relations of Polymers, Fibers, Fabrics and Composites, Material Selection, Manufacturing Processes, Process Induced Microstructure, Prediction of Composite Mechanical Properties, Dimensional Stability, Design of Cure Cycles, Mold Design.

882 Advanced Biochemical Engineering

890 Independent Study
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Approval of department. Supervised individual investigation of a problem in chemical engineering.

891 Selected Topics
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Physical and mathematical analysis of phenomena such as swirling flows or stability of reactions and transport processes.

892 Seminar
Fall, Spring. 1(0-2) A student may earn a maximum of 4 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Presentations of detailed studies on one or more specialized aspects of chemical engineering.

899 Master’s Thesis Research
Fall, Spring, Summer. 1 to 8 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Master’s thesis research.

972 Viscoelasticity and Flow of Polymeric Materials
Spring of odd years. 3(3-0) Time dependent and steady flow properties of polymeric materials related to molecular and structural parameters. Examples of polymeric blends and composites with thermoplastic and thermoset components.

999 Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 72 credits in all enrollments for this course. R: Open only to Chemical Engineering majors. Doctoral dissertation research.

CHEMISTRY

CHEMISTRY

Department of Chemistry
College of Natural Science

141 General Chemistry
Fall, Spring, 4(4-0) P:M: (MTH 103 or concurrently or MTH 110 or concurrently or MTH 116 or concurrently or MTH 124 or concurrently or MTH 132 or concurrently or MTH 152H or concurrently or LBS 117 or concurrently or LBS 118 or concurrently) or designated score on Mathematics placement test. Not open to students with credit in CEM 152 or CEM 182 or LBS 171. Atoms, molecules, ions; chemical calculations; reactions, energy changes; gases; periodic properties of elements; chemical bonds; states of matter; solutions; acids and bases; aqueous reactions and ionic equations.

142 General and Inorganic Chemistry
Fall, Spring, 3(4-0) P:M: (CEM 141 or LBS 171) Not open to students with credit in CEM 151 or LBS 172. Kinetics; gaseous equilibria; acids and bases; pH; aqueous equilibria involving buffers, hydrolysis, and titrations; heterogeneous equilibria of weakly soluble salts; electrochemistry; coordination chemistry, stereochemistry, and bonding within the transition elements.

143 Survey of Organic Chemistry
Fall, Spring, 4(3-0) P:M: (CEM 141 or CEM 151) Not open to students with credit in CEM 251 or CEM 351. Chemistry of carbon compounds. Chemistry of the main organic functional groups with applications to everyday life, industry, and biology.

151 General and Descriptive Chemistry
Fall, 4(4-0) P:M: (MTH 116 or concurrently or MTH 124 or concurrently or MTH 132 or concurrently or MTH 152H or concurrently or LBS 117 or concurrently or LBS 118 or concurrently) or designated score on Mathematics placement test. Not open to students with credit in CEM 142 or CEM 181H or LBS 172. Atomic and molecular structure; ionic and molecular bonding models; periodic trends; chemical reactivity by periodic group; nomenclature, structure, bonding and reactivity of coordination compounds; inorganic chemistry.

152 Principles of Chemistry
Spring, 3(3-0) P:M: (CEM 151) Not open to students with credit in CEM 141 or CEM 182H or LBS 171. The mole concept; stoichiometry and chemical calculations; gas laws; phase changes; thermodynamics; enthalpy, entropy and free energy; crystal structures; properties of solutions; chemical kinetics; gaseous equilibria; theory and reactions of acids/bases; aqueous equilibria; electrochemistry.

161 Chemistry Laboratory I
Fall, Spring. 1(0-3) P:M: (CEM 141 or concurrently or CEM 151 or concurrently) Not open to students with credit in LBS 171 or CEM 185H. Experiments in general chemistry; stoichiometry, calorimetry, electrochemistry, molecular geometry, gas laws, kinetics, acids and bases, and inorganic chemistry.

162 Chemistry Laboratory II
Fall, Spring, 1(0-3) P:M: (CEM 161 or LBS 171L or CEM 165H) and (CEM 142 or concurrently or CEM 152 or concurrently) Not open to students with credit in LBS 172L or CEM 186H. Analytical and inorganic chemistry; redox and acid base titrations; spectrophotometric and gravimetric analysis; preparation and analysis of coordination complexes of nickel, iron, and cobalt.

181H Honors Chemistry I
Fall, 4(4-0) P:M: (MTH 124 or concurrently or MTH 132 or concurrently or MTH 152H or concurrently or LBS 118 or concurrently) R: Approval of department. States of matter. Descriptive inorganic chemistry by periodic groups of elements. Kinetic theory of gases. Thermodynamics, chemical equilibrium and electrochemistry. Properties of solutions. Macro-molecular chemistry. Macroscopic kinetics.

182H Honors Chemistry II
Spring, 4(4-0) P:M: (CEM 181H) and (MTH 126 or concurrently or MTH 133 or concurrently or MTH 153H or concurrently) R: Approval of department. Subatomic, atomic and molecular structure. Quantum theory and bonding. Stereochemistry and enantiomorphy. Experimental methods of structure determination. Reactions of compounds of the main group and transition elements. Reaction dynamics. Nuclear chemistry.

185H Honors Chemistry Laboratory I
Fall, 2(0-6) P:M: (CEM 181H or concurrently) R: Approval of department. Spectroscopy and diffraction methods for the study of electronic structure and molecular geometry; synthesis and separation methods for the preparation and characterization of molecules; application to organic, organic, and biochemical molecules and materials.

186H Honors Chemistry Laboratory II
Spring, 2(0-6) P:M: (CEM 182H or concurrently) R: Approval of department. Laboratory research.

251 Organic Chemistry I
Fall, Spring, 3(4-0) P:M: (CEM 141 or CEM 152 or CEM 182H or LBS 171) Not open to students with credit in CEM 143 or CEM 351. Common classes of organic compounds including their nomenclature, structure, bonding, reactivity, and spectroscopic characterization.

252 Organic Chemistry II
Fall, Spring, 3(4-0) P:M: (CEM 251) Not open to students with credit in CEM 352. Completion of CEM 251 with emphasis on polyfunctional compounds, particularly those of biological interest.