Chemistry and Biochemistry (CHEM)

See Department of Chemistry and Biochemistry, click here

CHEM 1010 BPS Introduction to Chemistry 3©
For nonscience majors. Includes basic chemical concepts and a survey of the various branches of chemistry. Heavy emphasis on everyday applications to problems involving environmental pollution, radioactivity, energy sources, and human health. No prerequisites. (F,Sp)

CHEM 1110 BPS General Chemistry I 4
For nonscience majors. Progression made from the basic tenets of general chemistry to introduction to organic chemistry, with ascent in terms of practical importance and sophistication. Prerequisite: Math ACT score of at least 23, or MATH 1050 or higher; or corequisite of MATH 1050. (F,Sp)

CHEM 1115 General Chemistry Laboratory 1
(formerly CHEM 1130)
Laboratory course designed for nonscience majors. Covers basic aspects of general chemistry. Prerequisite: CHEM 1110. (F,Sp)

CHEM 1120 BPS General Chemistry II 4
Continuation of CHEM 1110. Continued coverage of organic chemistry, along with introduction to biochemistry. Prerequisite: CHEM 1110. (Sp)

CHEM 1210 Principles of Chemistry I 4
First of a two-semester sequence, covering fundamentals of chemistry. Designed for science and engineering students. Prerequisite: Math ACT score of at least 25, or MATH 1050 or higher; or corequisite of MATH 1050. High school chemistry recommended. (F,Sp)

CHEM 1215 Chemical Principles Laboratory I 1
(formerly CHEM 1230)
Laboratory course designed to be taken concurrently with CHEM 1210. Experiments cover acids/bases, thermochemistry separations, molecular weights, gases, and spectroscopy. Prerequisite: CHEM 1210 (may be taken concurrently). (F,Sp)

CHEM 1220 BPS Principles of Chemistry II 4
Continuation of CHEM 1210. Prerequisite: CHEM 1210. (F,Sp,Su)

CHEM 1225 Chemical Principles Laboratory II 1
(formerly CHEM 1240)
Continuation of CHEM 1215. Normally taken concurrently with CHEM 1220. Experiments cover elementary kinetics, electrochemistry, gravemetric analysis, chromatography, and equilibria. Prerequisite: CHEM 1215. (F,Sp)

CHEM 1990 Introduction to the Chemistry and Biochemistry Professions 1®
Seminar-format course designed to expose students to exciting areas of chemistry and biochemistry. Includes seminars on topical issues presented by faculty and invited guests. Discussion of career options. Graded Pass/Fail *only*. (Sp)

CHEM 2300 Principles of Organic Chemistry 3
Shape, bonding, nomenclature, stereochemistry, physical properties, and reactivity of organic molecules is covered for a range of molecules, beginning with simple alkanes and finishing with some of the more complex abiotic and biotic organic molecules known today. Prerequisite: CHEM 1210. (F)

CHEM 2310 Organic Chemistry I 4
First of a two-semester sequence, covering physical properties, nomenclature, mechanisms of reactions, and biological relevance of organic and bioorganic molecules. Prerequisite: CHEM 1220. (F)

CHEM 2315 Organic Chemistry Laboratory I 1
(formerly CHEM 2330)
Laboratory course designed to accompany CHEM 2310. Covers basic aspects of experimental organic chemistry. Prerequisites: CHEM 1210 and 1215. (F)

CHEM 2320 Organic Chemistry II 4
Continuation of CHEM 2310. Prerequisite: CHEM 2310 *or* CHEM 2300 and permission of instructor. (Sp)

CHEM 2325 Organic Chemistry Laboratory II 1
(formerly CHEM 2340)
Continuation of CHEM 2315. Prerequisite: CHEM 2315. (Sp)

CHEM 3000 QI Quantitative Analysis 3
(formerly CHEM 3600 QI)
Basic theory and laboratory practice in analytical chemistry, including introduction to multiple equilibria and chemical separation methods. Prerequisites: CHEM 1215, 1225, MATH 1050 or higher. (F)

CHEM 3005 Quantitative Analysis Laboratory 1
(formerly CHEM 3610)
One three-hour laboratory per week. Must be taken concurrently with CHEM 3000. Prerequisites: CHEM 1215, 1225, MATH 1050 or higher. (F)

CHEM 3060 QI Physical Chemistry 3
Chemical thermodynamics. Laws of thermodynamics. Changes of state. Chemical equilibrium. Introduction to quantum mechanics. Schrodinger equation. Exactly-soluble problems. Prerequisites: CHEM 1220, MATH 2210, PHYX 2220. (F)

CHEM 3070 QI Physical Chemistry 3
Chemical applications of quantum mechanics, periodic table, and chemical bonding. Spectroscopy. Statistical thermodynamics. Chemical kinetics. Rate laws. Reaction mechanisms. Theories of reaction rates. Prerequisite: CHEM 3060. (Sp)

CHEM 3080 CI Physical Chemistry Laboratory I 1
Experimental work to accompany CHEM 3060. Corequisite: CHEM 3060. (F)

CHEM 3090 CI Physical Chemistry Laboratory II 1
Continuation of CHEM 3080. Experimental work to accompany CHEM 3070. Corequisite: CHEM 3070. (Sp)

CHEM 3510 Intermediate Inorganic Chemistry 2
Survey of basic structure, bonding, and reactivity across the periodic table. Prerequisites: CHEM 1220, 2310, and 2315. (Sp)

CHEM 3520 Inorganic Chemistry Laboratory 1
Covers basic aspects of inorganic synthesis and compound characterization. Corequisite: CHEM 3510. (Sp)

CHEM 3650 DSC Environmental Chemistry* 3**
Survey of issues and chemical nature of environmental problems, including air, soil, and water pollution. Prerequisite: CHEM 1010 or 1120 or 1220. (Sp)

CHEM 3700 Introductory Biochemistry 3
Brief survey of the chemistry of biologically important compounds and their role in microbial, animal, and plant metabolism. Prerequisite: CHEM 2300 or 2310. (Sp)

CHEM 3710 Introductory Biochemistry Laboratory 1
Laboratory course designed to accompany CHEM 3700. Corequisite: CHEM 3700. (Sp)

CHEM 3750 Chemistry Special Topics (Topic) 1-3
(F,Sp,Su)

CHEM 4250 Cooperative Experience 1-2®
Planned work outside the University. Specific experience must receive prior approval for credit to be earned. Consult advisor or department head for details. (F,Sp,Su)

CHEM 4800 CI Research Problems 1-3®
Directed undergraduate research. Departmental permission required. (F,Sp,Su)

CHEM 4890 CI Undergraduate Biochemistry Seminar 2
Presentation of scientific seminars, critiquing of and participation in departmental seminars, scientific literature searching, accessing and using scientific databases, career preparation and development. To be taken during senior year of biochemistry major. (F,Sp)

CHEM 4990 CI Undergraduate Seminar 2®
Writing and speaking skills necessary for presenting scientific information. (F,Sp)

Course Descriptions

CHEM 5070 Biophysical Chemistry 3
Biological applications and theories of physical chemistry. Equilibrium, thermodynamics, chemical kinetics, transport properties, and spectroscopy. Prerequisites: CHEM 1220; MATH 1220; and PHYX 2120 or 2220. (F)

CHEM 5520 Advanced Inorganic Chemistry 2
Advanced treatment of the structure/bonding/reactivity relationships across the periodic table. Prerequisites: CHEM 3070, 3510. (F)

CHEM 5530 Advanced Synthesis Laboratory 2
Laboratory course in advanced synthetic techniques, including vacuum lines, inert atmosphere, Schlenk manipulations, liquid ammonia solvent, and tube furnace reactions. Prerequisites: CHEM 2325, 3070, 3520. (Sp)

CHEM 5640 Instrumental Analysis 3
Theory and application of physiochemical methods of analysis. Chromatography. Selected electrochemical and optical methods. Prerequisites: CHEM 3005, 3080. (Sp)

CHEM 5650 Instrumental Analysis Laboratory 2
Laboratory course to accompany CHEM 5640. Two three-hour labs per week. Prerequisites: CHEM 3005, 3080. (Sp)

CHEM 5670 Intermediate Environmental Chemistry 3**
Survey of chemical processes and pollutants in the environment. Sampling and analysis of pollutants to determine chemical fate. Prerequisites: CHEM 3000 and 3005; CHEM 3070 recommended. (Sp)

CHEM 5680 Environmental Chemistry Laboratory 2**
Laboratory course to accompany CHEM 5670. Field sampling and laboratory analysis of air, water, and soil samples. Method building and hypothesis testing. Prerequisites: CHEM 3000, 3005. Corequisite: CHEM 5670. (Sp)

CHEM 5700 General Biochemistry I 3
General biochemistry for science majors, including proteins, enzymes, catalysis, bioenergetics, and catabolic metabolism. Prerequisite: CHEM 2320. (F)

CHEM 5710 General Biochemistry II 3
Continuation of CHEM 5700. General biochemistry for science majors, including anabolic metabolism, DNA, RNA, and protein synthesis. Prerequisite: CHEM 5700. (Sp)

CHEM 5720 General Biochemistry Laboratory 3
Prerequisite: CHEM 5710 (may be taken concurrently). (Sp)

CHEM 5730 Genomic Technologies 4
Provides theoretical background in genomics/proteomics technologies and laboratory training in advanced techniques. Topics include: whole genome sequencing, transcriptome and proteome characterization, DNA and expressed gene libraries, and operation of modern genomics laboratory equipment. Prerequisites: BIOL 1220, 3200; CHEM 3700 or 5710; CS 2200; STAT 3000. Also taught as BIOL 5730. (Sp)

CHEM 6010 Quantum Chemistry* 3**
Quantum mechanics applied to chemical problems. Theory of atoms and molecules. Prerequisites: CHEM 3070, MATH 2250. (F)

CHEM 6020 Molecular Spectroscopy* 3**
Spectroscopy of atoms and molecules. Prerequisite: CHEM 6010. (Sp)

CHEM 6250 Curricular Practical Training 1-6®
Work experience tied to academics, in the graduate student's major field of study, either chemistry or biochemistry, for which the student is paid. Prerequisite: Permission of department head prior to enrollment. (F,Sp,Su)

CHEM 6300 Advanced Modern Organic Chemistry* 3**
Covers topics in molecular structure, reaction mechanisms of organic molecules, and physical organic chemistry. Prerequisites: CHEM 2320, 3070. (F)

CHEM 6500 Reactivity and Mechanisms in Inorganic Chemistry* 3**
Inorganic reactions and mechanisms relevant to areas of main group, transition metals, and bioinorganic and organometallic chemistry. Prerequisite: CHEM 5520. (Sp)

CHEM 6510 Chemical Applications of Group Theory 1
Introduction to symmetry point groups and theorems of group theory for application to structure, bonding, and spectroscopy. Some familiarity with linear algebra is recommended. Prerequisite: CHEM 3070. (F)

CHEM 6600 Modern Chemical Analysis* 3**
Methodology and statistical treatment of chemical data, experimental design, quality control, and chemical separations. Prerequisites: CHEM 5640, graduate standing, or instructor's permission. (Sp)

CHEM 6700 Advanced Biochemistry I 3
Advanced-level biochemistry course intended for biochemistry MS and PhD students. Covers proteins, enzyme mechanism, nucleic acid structure and function, and catabolic metabolism at a level appropriate for students preparing for the qualifying examination. This course (which is co-instructed with CHEM 5700, with additional projects for CHEM 6700) cannot be taken for credit by students who have previously taken CHEM 5700 for credit. (F)

CHEM 6710 Advanced Biochemistry II 3
Advanced-level biochemistry course intended for biochemistry MS and PhD students. Covers anabolic metabolism and bioinformation processes at a level appropriate for students preparing for the qualifying examination. This course (which is co-instructed with CHEM 5710, with additional projects for CHEM 6710) cannot be taken for credit by students who have previously taken CHEM 5710 for credit. (Sp)

CHEM 6720 Advanced Biochemistry Laboratory 2®
To obtain advanced laboratory skills, students complete specific laboratory experiments in research laboratories of departmental faculty members. (F,Sp)

CHEM 6730 Principles of Enzymology* 3
Mechanisms of enzyme action, emphasizing recent advances in enzymology, including theory and modern experimental approaches to elucidation of mechanism. Prerequisite: CHEM 5700 or 6700 or permission of instructor. (Sp)

CHEM 6740 Cellular Communication by Small Molecules and Proteins 3**
Using post-translational modifications, small molecules, and protein motifs in cellular communication. Variances in the communication systems related to disease state and/or cell stress and therapeutic strategies to manipulate the communication systems. Prerequisite: CHEM 5700 or 6700 or permission of instructor. Also taught as BIOL 6740. (Sp)

CHEM 6750 Principles of Structural Biology 3
General principles of protein and nucleic acid structure. Approaches to understanding biological function through structural analysis. Prerequisite: CHEM 5700 or 6700 or instructor approval. (F)

CHEM 6760 Principles of Bioenergetics* 3**
Global biological energy cycles including carbon, nitrogen, and sulfur cycles; respiration; electron transfer; and energy transduction. Prerequisite: CHEM 5700 or 6700 or permission of instructor. (F)

CHEM 6910 Special Problems in Chemistry and Biochemistry 1-4
Selected problems in chemistry and biochemistry. Registration permitted only with written permission from department head. (F,Sp,Su)

CHEM 6970 Thesis Research 1-10®
Research for MS degree. Graded Pass/Fail *only*. (F,Sp,Su)

CHEM 6990 Continuing Graduate Advisement 1-9®
Graded Pass/Fail *only*. (F,Sp,Su)

CHEM 7020 Statistical Mechanics* 3**
Statistical mechanics with applications to research problems of current interest. Prerequisite: CHEM 6010.

CHEM 7030 Special Topics in Physical Chemistry (Topic)* 3®**
Covers special areas of current interest and activity in physical chemistry. (F,Sp)

CHEM 7300 Reactions and Synthesis in Modern Organic Chemistry 3**
Reactions of modern organic chemistry and their application to organic synthesis. Prerequisite: CHEM 6300. (Sp)

CHEM 7310 Molecular Structure/Spectroscopy of Organic Compounds* 3
Modern methods of predicting and determining molecular structure of organic compounds using advanced computational and spectroscopic tools. Prerequisite: CHEM 6300. (F)

CHEM 7330 Special Topics in Organic Chemistry (Topic)* 3®**
Covers special areas of current interest and activity in organic chemistry. Prerequisite: CHEM 6300. (F,Sp)

CHEM 7500 Coordination Chemistry* 3**
Theory and spectroscopy of transition metal coordination complexes. Prerequisites: CHEM 3070, 6500, 6510. (Sp)

CHEM 7510 Bioinorganic Chemistry* 1-3**
Advanced systematic study of metallobiochemical structure and function. Prerequisite: CHEM 6500. (F)

CHEM 7530 Special Topics in Inorganic Chemistry (Topic)* 3®**
Topics of current interest in inorganic chemistry. Prerequisite: CHEM 6500. (Sp)

CHEM 7600 Analytical Spectroscopy 3**
Practical description of spectroscopy-based analysis, emphasizing instrumentation and methods. Prerequisites: CHEM 5640, graduate standing, or instructor's permission. (Sp)

CHEM 7610 Chemical Separations* 3
Survey of theory and practice of modern chemical separations, including extractions, chromatography, distillation, and phase separations. Prerequisites: CHEM 5640, graduate standing, or instructor's permission. (F)

CHEM 7620 Electrochemistry* 3**
Survey of electrochemistry with emphasis on electrochemical analysis. Prerequisites: CHEM 5640, graduate standing, or instructor's permission. (F)

CHEM 7640 Special Topics in Analytical Chemistry (Topic)* 1-3®**
Topics may include electronics from the scientist's perspective, laser-based spectroscopy, mass spectrometry, and chemometrics. Prerequisites: CHEM 5640, graduate standing, or instructor's permission. (F,Sp)

CHEM 7770 Special Topics in Biochemistry (Topic)* 2-3®
Topics of current interest in biochemistry.

CHEM 7800 Seminar 1®
Graduate seminar. Graded Pass/Fail *only*. (F,Sp)

CHEM 7970 PhD Dissertation Research 1-12®
Graded Pass/Fail *only*. (F,Sp,Su)

CHEM 7990 Continuing Graduate Advisement 1-9®
Graded Pass/Fail *only*. (F,Sp,Su)

*Taught 2008-2009.
**Taught 2007-2008.
***Contact Department o!f Chemistry and Biochemistry for information about when this course will be taught.
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