Currently approved graduate courses in Chemistry:

Course number	Title, units	Description
CHEM 200	Advanced Organic Synthesis [3]	Logical approaches to designing syntheses of target organic compounds. Introduction to retrosynthetic analyses and background on the reactions needed to achieve common syntheses; protecting groups and stereoselective methodologies. Classic syntheses are discussed in the context of modern methods. Introduction to literature search tools, a practical estimate of the reliability of published protocols, and references on chemical purification.
CHEM 201	Organic and Organometallic Reaction Mechanisms [3]	Thermodynamics, statistical mechanics, and molecular orbital theory are used to explain reactivity, product distributions, the stability of intermediates, and transition state structure. Elements of computational chemistry, kinetic methods of interrogation, linear free energy relationships, kinetic isotope effects, and other methods for empirically constructing plausible reaction mechanisms
CHEM 202	Bioorganic Chemistry [3]	The molecular basis of biological processes. Methods by which enzymes catalyze organic reactions; experimental methods by which the mechanisms of enzyme-catalyzed reactions are elucidated; chemistry of disease states and drug action.
CHEM 212	Molecular and Solid State Quantum Chemistry [3]	Theory and practical application of molecular quantum mechanics. Schrödinger equation and matrix representations of quantum mechanics; simple exactly solvable model problems; calculation of observable properties; vibrational and electronic wave functions; approximation methods; quantum mechanics of spectroscopy.
CHEM 213	Chemical Thermodynamics and Kinetics [3] *(being replaced by CHEM 214 + 215)*	Statistical mechanics, thermodynamics, and chemical kinetics, taught from a perspective that develops the behavior of bulk matter from molecular properties; modern experimental and theoretical methods in kinetics.
CHEM 215	Chemical Kinetics [3]	The rates and mechanisms of elementary reactions, unimolecular reactions, reactions in the gas phase, in solutions and on surfaces. Energy and charge transfer phenomena. Kinetics of surface and enzyme catalysis. Kinetic modeling of multistep reactions.
CHEM 231	Molecular Spectroscopy [3]	Time-dependent quantum mechanics; interaction of radiation with matter; electronic spectra of atoms and molecules; vibrational, rotational, and Raman spectra; magnetic resonance spectroscopy; X-ray, neutron, and electron diffraction. Modern experimental and theoretical methods in spectroscopy.
CHEM 290	Current Topics in Physics and Chemistry [3]	Exploration of current research directions, problems, and techniques in molecular and materials chemistry, physics, and engineering. Course format emphasizes student-led

		presentation, analysis, and discussion of reading assignments from the current and recent scientific literature. Topics are determined by the instructor and change each semester.
CHEM 291	Physics and Chemistry Seminar [1]	Graduate seminar in physics and chemistry. *S/U grading only.*
CHEM 295	Graduate Research [1 - 15]	Supervised research. *Permission of instructor required. S/U grading only.*
CHEM 298	Directed Group Study [1 - 6]	Group project under faculty supervision. *Permission of instructor required. S/U grading only.*
CHEM 299	Directed Independent Study [1 - 6]	Independent project under faculty supervision. *Permission of instructor required. S/U grading only.*

Currently approved graduate courses in other:

PHYS 210	Electrodynamics and Optics I [4]	Introduction to electrodynamics. Electrostatics including Poisson and Laplace equations, Green's theorem and different boundary value problems, polarizability, susceptibility and dielectric media. Magnetostatics, Maxwell's equations, plane electromagnetic waves, polarization of light, electromagnetic radiation in different media.
PHYS 212	Statistical Mechanics [4]	Topics include: General principles of statistical mechanics including microcanonical, macrocanonical and grand canonical ensembles, fluctuations and equilibrium. Thermodynamics including Legendre transforms and Maxwell relations, fluctuations and stability and Landau theory. Quantum statistical mechanics including Bose-Einstein and Fermi-Dirac statistics.
PHYS 237	Quantum Mechanics I [4]	Introductory Quantum Mechanics starting with simple quantum two-state systems and one-dimensional problems, uncertainty relations, solution of Schrödinger's equation for important two and three dimensional physical situations, angular momentum, identical particles and spin statistics. Hydrogen and multi-electron atoms.
PHYS 238	Quantum Mechanics II [4]	Perturbation methods, both stationary and time-dependent, scattering, interaction with electromagnetic fields, Stark effect, measurement theory and decoherence, quantum Hall effect.
PHYS 241	Condensed Matter Physics [4]	An introduction to the physics of materials designed for graduate students in physics or chemistry. The course will cover traditional solid state physics and include topics in soft matter. This class will examine the relationship between microscopic structure and bulk properties.
QSB 207 (to be cross-listed with CHEM)	Physical Biochemistry [3]	Physical Biochemistry is the study of properties such as macromolecular folding, multimerization, structure, and ligand binding. This course will instruct students on these, and on the experimental techniques that can quantitatively probe these properties, including hands-on work with multidimensional NMR data. Also included is in-depth discussion of recent biophysical literature.

QSB 212	Advanced Signal Transduction and Growth Control [4]	Signal transduction in mammalian cells with emphasis on molecular and genetic regulation of these processes and their role in cell function.
QSB 281 (to be cross-listed with CHEM)	Advanced Computational Biology [4]	Introduction to the principles and application of computational simulations and modeling in biology, ranging from bioinformatics to computational cell biology. Topics to be covered include genome sequence analysis and annotation, phylogenic analysis, protein structure prediction, molecular modeling, and docking and simulations of metabolic and regulatory networks.
QSB 294	Responsible Conduct of Research [1]	Seminar covering responsibilities and expectations for researchers as well as advice for success in graduate school and science careers, required for NIH-funded graduate students. *S/U grading only*.