Currently approved graduate courses in Chemistry:

<table>
<thead>
<tr>
<th>Course number</th>
<th>Title, units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 200</td>
<td>Advanced Organic Synthesis [3]</td>
<td>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.</td>
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<tr>
<td>CHEM 201</td>
<td>Organic and Organometallic Reaction Mechanisms [3]</td>
<td>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.</td>
</tr>
<tr>
<td>CHEM 213</td>
<td>Chemical Thermodynamics and Kinetics [3] <em>(being replaced by CHEM 214 + 215)</em></td>
<td>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.</td>
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</table>
presentation, analysis, and discussion of reading assignments from the current and recent scientific literature. Topics are determined by the instructor and change each semester.

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S/U grading only.                      |
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:

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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,  
quadratic Hall effect.                  |
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. |
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<td>QSB 212</td>
<td>Advanced Signal Transduction and Growth Control [4]</td>
<td>Signal transduction in mammalian cells with emphasis on molecular and genetic regulation of these processes and their role in cell function.</td>
</tr>
<tr>
<td>QSB 281 (to be cross-listed with CHEM)</td>
<td>Advanced Computational Biology [4]</td>
<td>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, phylogenetic analysis, protein structure prediction, molecular modeling, and docking and simulations of metabolic and regulatory networks.</td>
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<tr>
<td>QSB 294</td>
<td>Responsible Conduct of Research [1]</td>
<td>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.  <em>S/U grading only.</em></td>
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