

# CHEMISTRY (CHEM)

Subject-area course lists indicate courses currently active for offering at the University of Louisville. Not all courses are scheduled in any given academic term. For class offerings in a specific semester, refer to the Schedule of Classes ([https://csprd.louisville.edu/psp/ps\\_class/EMPLOYEE/PSFT\\_CS/c/COMMUNITY\\_ACCESS.CLASS\\_SEARCH./x/?state=62dab551a0d600a5e8237359c50704e59007&duo\\_code=sjUx20STj21](https://csprd.louisville.edu/psp/ps_class/EMPLOYEE/PSFT_CS/c/COMMUNITY_ACCESS.CLASS_SEARCH./x/?state=62dab551a0d600a5e8237359c50704e59007&duo_code=sjUx20STj21)).

500-level courses generally are included in both the undergraduate- and graduate-level course listings; however, specific course/section offerings may vary between semesters. Students are responsible for ensuring that they enroll in courses that are applicable to their particular academic programs.

## Course Fees

Some courses may carry fees beyond the standard tuition costs to cover additional support or materials. Program-, subject- and course-specific fee information can be found on the Office of the Bursar website (<https://louisville.edu/bursar/tuitionfee/university-fees/>).

### CHEM 501. Independent Study 1-3 Units

**Prerequisite(s):** Minimum GPA of 3.0 overall; minimum GPA of 3.5 in department and at least 18 semester hours credit in the department.

**Description:** Independent research conducted with the approval and supervision of a faculty member.

**Note:** Credit may not be applied to an advanced degree in Chemistry.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 503. Special Topics in Chemistry 1-3 Units

**Description:** An examination of one or more specified areas of Chemistry. Details announced each semester.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 515. Inorganic Chemistry 3 Units

**Term Typically Offered:** Fall Only

**Prerequisite(s):** CHEM 342; concurrent enrollment in CHEM 441 or CHEM 465.

**Description:** Descriptive and theoretical chemistry of the elements.

**Note:** Credit may not be applied to an advanced degree in Chemistry.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 527. Spectroscopic Identification of Organic Compounds - WR

**3 Units**

**Term Typically Offered:** Fall Only

**Prerequisite(s):** CHEM 342 and CHEM 344.

**Fee:** An additional \$60.00 is charged for this course.

**Description:** An introductory spectroscopy course designed to provide a realistic experience in organic structure determination using the principal methods of spectral characterization. Emphasis is placed on using mass spectrometry, infrared, and nuclear magnetic resonance spectroscopy, and infrared spectroscopy to deduce the molecular structures of organic compounds.

**Note:** Approved for the Arts and Sciences upper-level requirement in written communication (WR).

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 528. Contemporary Methods of Organic Synthesis and Analysis - CUE

**2 Units**

**Term Typically Offered:** Spring Only

**Prerequisite(s):** CHEM 342, CHEM 344, and (CHEM 425 or CHEM 527).

**Fee:** An additional \$60.00 is charged for this course.

**Description:** A discovery-based approach to the solution of problems encountered in organic chemical synthesis and analysis.

**Note:** Credit may not be applied to an advanced degree in Chemistry.

**Course Attribute(s):** CUE - This course fulfills the Culminating Undergraduate Experience (CUE) requirement for certain degree programs. CUE courses are advanced-level courses intended for majors with at least 90 earned credits/senior-level status.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 529. Contemporary Methods of Inorganic Synthesis and Analysis - WR

**2 Units**

**Term Typically Offered:** Spring Only

**Fee:** An additional \$60.00 is charged for this course.

**Description:** Prerequisites or corequisites: CHEM 515. A discovery-based approach to the solution of problems encountered in inorganic chemical synthesis and analysis.

**Note:** Credit may not be applied to an advanced degree in Chemistry.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

### CHEM 532. Chemistry Education for Secondary Teachers 4 Units

**Prerequisite(s):** CHEM 342 In-depth examination of chemistry content for secondary teachers as aligned with national and state standards.

**Description:** Inquiry-based laboratory and diverse assessment of core concepts will be developed.

**Note:** Does not count toward a degree in Chemistry except by departmental permission.

For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)

<b>CHEM 545. Biochemistry I</b> <b>Term Typically Offered:</b> Fall Only <b>Prerequisite(s):</b> CHEM 342. <b>Description:</b> Chemistry of amino acids, peptides, proteins, carbohydrates, nucleotides and nucleic acids; methods of analysis and laboratory synthesis; enzyme properties, kinetics, ligand binding. <b>Note:</b> Credit may not be earned in both CHEM 545 and CHEM 645, or in both CHEM 545 and CHEM 445. <b>Note:</b> Credit may not be applied toward an advanced degree in Chemistry.  For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>	<b>CHEM 557. Bio-Organic Phenomena</b> <b>Term Typically Offered:</b> Spring Only <b>Prerequisite(s):</b> CHEM 342 (or equivalent). <b>Description:</b> Completion of CHEM 445, CHEM 545, or equivalent is strongly recommended. Special topics in the biological chemistry area: e.g., chemical carcinogenesis; diet and cancer, food chemistry and polypeptides; proteins; carbohydrates; enzymes; hormone chemistry. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
<b>CHEM 546. Biochemistry Laboratory</b> <b>Term Typically Offered:</b> Occasionally Offered <b>Prerequisite(s):</b> CHEM 445 or concurrent enrollment in CHEM 545. <b>Fee:</b> An additional \$60.00 is charged for this course. <b>Description:</b> Application of contemporary laboratory methods of biochemistry including uv/vis spectrophotometry, liquid chromatography centrifugation, gel electrophoresis, mass spectrometry, FTIR, and recombinant DNA techniques. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>2 Units</b>	<b>CHEM 591. Chemistry for Teachers I</b> <b>Prerequisite(s):</b> For graduate education majors; must have experience in teaching chemistry principles in elementary, middle, or secondary schools. <b>Description:</b> Teaching pre-college chemistry with emphasis on curriculum content, laboratory procedures, and process skills. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
<b>CHEM 547. Biochemistry II</b> <b>Term Typically Offered:</b> Occasionally Offered <b>Prerequisite(s):</b> CHEM 545. <b>Description:</b> Cellular metabolism of carbohydrates, lipids, amino acids and biomembrane phenomena; RNA, DNA, and protein synthesis. <b>Note:</b> Credit may not be earned in both CHEM 547 and CHEM 647, or in both CHEM 547 and CHEM 445. <b>Note:</b> Credit may not be applied to an advanced degree in chemistry.  For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>	<b>CHEM 620. Optical Spectrochemical Methods of Analysis</b> <b>Prerequisite(s):</b> CHEM 527. <b>Description:</b> Principles, instrumentation, and applications of atomic and molecular spectroscopic techniques used in the IR, VIS, and UV spectral regions. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
<b>CHEM 550. Group Theory and its Chemical Applications</b> <b>Term Typically Offered:</b> Occasionally Offered <b>Prerequisite(s):</b> CHEM 441 or CHEM 465 Elementary group theory; the use of group theory to treat symmetry; application to atomic structure, molecular structure, spectroscopy, and reaction mechanisms. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>	<b>CHEM 621. Electroanalytical Chemistry</b> <b>Prerequisite(s):</b> CHEM 527. <b>Description:</b> Principles of modern voltammetric and potentiometric methods of chemical analysis including fundamental theory, instrumentation, and applications. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
<b>CHEM 555. Theory and Application of Computational Chemistry</b> <b>Prerequisite(s):</b> CHEM 441 or CHEM 465 or PHYS 300. <b>Description:</b> Theory and Application of Computational Chemistry will be a combined elective undergraduate and graduate level course. The purpose of the course is to provide students with the necessary knowledge such that they can examine chemical problems computationally and where required, use computational tools to benefit their own research. The course will emphasize practical applications of computers in chemistry, trends that define the appropriate methods for chemical studies, and elucidation of underlying theoretical methods. As the abstract nature of the field is frequently a learning barrier to many students, the course will incorporate a series of workshops to enable students to build their own computer programs and study chemical problems computationally. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>	<b>CHEM 622. Analytical Separations</b> <b>Prerequisite(s):</b> CHEM 527. <b>Description:</b> Survey of major instrumental separation methods in chemistry and biochemistry with an emphasis on modern chromatographic techniques. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
		<b>CHEM 625. Advanced Analytical Chemistry</b> <b>Prerequisite(s):</b> CHEM 527. <b>Description:</b> A survey of theoretical and practical aspects of modern methods of analysis. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>3 Units</b>
		<b>CHEM 626. Special Topics in Analytical Chemistry</b> <b>Prerequisite(s):</b> CHEM 528 and CHEM 529, or consent of instructor. <b>Description:</b> Recent developments in selected areas of Analytical Chemistry. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>1-3 Units</b>

<b>CHEM 628. Special Topics in Synthesis and Analysis</b> 1 Unit <b>Prerequisite(s):</b> Completion of, or coregistration in, CHEM 528, or consent of instructor. <b>Description:</b> Current topics in high resolution NMR, mass spectrometry and organic synthesis. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 652. Independent Study</b> 1-3 Units <b>Description:</b> Credit according to achievement; limited to 3 hours per semester For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 630. Advanced Topics in Chemical Analysis</b> 1 Unit <b>Prerequisite(s):</b> Completion of, or co-registration in, CHEM 529, or consent of instructor. <b>Description:</b> A discovery-based approach to the solution of advanced problems in chemical analysis with an emphasis on separations, electrochemistry and X-ray crystallography. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 653. Main Group Chemistry</b> 3 Units <b>Prerequisite(s):</b> CHEM 515. <b>Description:</b> Survey of the descriptive chemistry of the main group elements and topics of current interest in main group chemistry such as bonding theories, reaction mechanisms, electronic materials, and catalytic materials. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 632. Chemical Education</b> 3 Units <b>Prerequisite(s):</b> BS, BA, or minor in Chemistry, or consent of instructor. <b>Description:</b> In-depth examination of learning theories and chemistry content. Lesson plans, teaching philosophies, and research projects framed by learning theories will be developed. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 654. Advanced Coordination Chemistry</b> 3 Units <b>Prerequisite(s):</b> CHEM 515. <b>Description:</b> Survey of structure, bonding, and reactivity of the transition metal complexes. Covers topics such as organometallic and bioinorganic chemistry, group theory, and magnetism. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 645. Advanced Biochemistry I</b> 4 Units <b>Prerequisite(s):</b> CHEM 342. <b>Description:</b> Chemistry of amino acids, peptides, proteins, nucleotides and nucleic acids; methods of analysis and laboratory synthesis; enzyme properties, kinetics, ligand binding. <b>Note:</b> Lectures concurrent with CHEM 545; one added lecture hour each week covers advanced topics. <b>Note:</b> Credit may not be earned in both CHEM 545 and CHEM 645.  For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 655. Special Topics in Inorganic Chemistry</b> 1-3 Units <b>Prerequisite(s):</b> CHEM 515. <b>Description:</b> Current problems in inorganic chemistry. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 647. Advanced Biochemistry II</b> 4 Units <b>Description:</b> Cellular metabolism of carbohydrates, lipids, amino acids and nucleotides; biomembrane phenomena; RNA, DNA and protein synthesis. Lectures concurrent with CHEM 547; one added lecture hour each week covers advanced topics. <b>Note:</b> Credit may not be earned in both CHEM 547 and CHEM 647.  For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 656. Special Topics in Inorganic Chemistry</b> 1-3 Units <b>Prerequisite(s):</b> CHEM 515. <b>Description:</b> Current problems in inorganic chemistry. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 648. Systems Biochemistry: Principles and Practices</b> 3 Units <b>Prerequisite(s):</b> CHEM 647, BIOC 645, or consent of instructor. <b>Description:</b> Integration of global metabolic functions with protein and gene-level regulations. Analytical approaches to enable such integration. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 659. Materials Chemistry and Methods</b> 3 Units <b>Prerequisite(s):</b> CHEM 515 or equivalent course in organic chemistry. <b>Description:</b> Course content will include a range of characterization methods and properties of materials. The main properties of interest are structural properties, magnetism and charge transport. Basic principles as well as methods of investigation and characterization of these properties will be discussed. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )
<b>CHEM 651. Independent Study</b> 1-3 Units <b>Description:</b> Credit according to achievement; limited to 3 hours per semester For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	<b>CHEM 660. Advanced Physical Chemistry</b> 3 Units <b>Prerequisite(s):</b> One year of physical chemistry, one semester of atomic and molecular physics. <b>Description:</b> Introduction to quantum chemistry. For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )

<b>CHEM 661. Chemical Thermodynamics</b>	<b>3 Units</b>	<b>CHEM 672. Quantum Chemistry</b>	<b>3 Units</b>
<b>Prerequisite(s):</b> One year of physical chemistry.		<b>Prerequisite(s):</b> CHEM 561 or CHEM 660.	
<b>Description:</b> Advanced discussion of the principles of thermodynamics including an introduction to statistical thermodynamics; applications to chemical systems.		<b>Description:</b> Principles of quantum theory with applications to chemistry; and advanced treatment of atomic and molecular structure including Slater-Condon methods for atoms and LCAO-MO-SCF methods for molecules; introduction to ab initio methods.	
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>CHEM 665. Special Topics in Physical Chemistry</b>	<b>1-3 Units</b>	<b>CHEM 675. Special Topics in Organic Chemistry</b>	<b>1-3 Units</b>
<b>Description:</b> An examination of one or more specified areas of Physical Chemistry. Topics vary; details announced each semester.		<b>Prerequisite(s):</b> One year of organic chemistry.	
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		<b>Description:</b> Current problems in organic chemistry; organometallic chemistry; free radical reactions; carbohydrates and nucleosides; peptides.	
<b>CHEM 666. Special Topics in Physical Chemistry</b>	<b>1-3 Units</b>	For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>Description:</b> An examination of one or more specified areas of Physical Chemistry. Topics vary; details announced each semester.		<b>CHEM 677. Mechanisms and Theory in Organic Chemistry</b>	<b>3 Units</b>
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		<b>Prerequisite(s):</b> Two semesters of undergraduate organic chemistry.	
<b>CHEM 667. Reaction Kinetics</b>	<b>3 Units</b>	<b>Description:</b> This course focuses on the mechanism and theory of classical and contemporary organic reactions, including acid and base catalysis, pericyclic reactions, metal-mediated reactions and radical and photochemical reactions.	
<b>Prerequisite(s):</b> One year of physical chemistry.		For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>Description:</b> Theory of the rate of chemical reactions; methods of studying reaction rates; reaction energetics; reactions in solution; chain reactions and inference of mechanism from rate studies.		<b>CHEM 678. Advanced Organic Chemistry: General Survey</b>	<b>3 Units</b>
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		<b>Prerequisite(s):</b> One year each of organic and physical chemistry.	
<b>CHEM 668. Electrochemistry</b>	<b>3 Units</b>	<b>Description:</b> First semester (CHEM 678): an introduction to advanced physical organic chemistry, linear free energy relationship, kinetics, isotope effects and spectroscopic techniques as used in the interpretation of reaction mechanisms. Second semester (CHEM 679): an introduction to advanced organic chemistry emphasizing reactions and synthesis, and including spectral applications.	
<b>Prerequisite(s):</b> Consent of instructor.		For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>Description:</b> A thermodynamic and kinetic study of electrochemical phenomena, including electrical conductivity, electrophoresis, electrode potentials, and electrode processes.		<b>CHEM 679. Advanced Organic Synthesis</b>	<b>3 Units</b>
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		<b>Prerequisite(s):</b> One year each of organic and physical chemistry.	
<b>CHEM 670. Chemistry of Heterocyclic Compounds and Alkaloids</b>	<b>3 Units</b>	<b>Description:</b> An introduction to advanced organic chemistry emphasizing modern synthesis reagents, reactions and their mechanisms.	
<b>Prerequisite(s):</b> One year each of organic and physical chemistry.		For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>Description:</b> Structures, reactivities, activities, and synthesis of heterocyclic systems including natural products and their uses in medicine.		<b>CHEM 681. Modern Biochemistry I</b>	<b>3 Units</b>
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )		<b>Prerequisite(s):</b> One year each of organic and physical chemistry or consent of instructor.	
<b>CHEM 671. Advanced Polymer Chemistry</b>	<b>3 Units</b>	<b>Description:</b> Chemistry and physical properties of proteins, other biopolymers; enzymatic reaction mechanisms and kinetics; bioenergetics.	
<b>Prerequisite(s):</b> One year each of organic and physical chemistry.		For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )	
<b>Description:</b> Polymer characterization, physical properties and structure. Conformational changes, elasticity, relaxation phenomena, size and chain distributions; application of microscopy, spectroscopy, magnetic resonance, and diffraction to polymers; liquid crystals.			
For class offerings for a specific term, refer to the Schedule of Classes ( <a href="http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm">http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm</a> )			



**CHEM 682. Modern Biochemistry II****3 Units****Prerequisite(s):** CHEM 681 or consent of instructor.**Description:** Carbohydrate, lipid, protein, and nucleic acid metabolism; endocrine control of metabolism and physiological activities.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 684. Biophysical Chemistry****3 Units****Prerequisite(s):** CHEM 462 (or equivalent) and CHEM 545/CHEM 645, or consent of instructor.**Description:** Basis theory and practical applications of modern biophysical methods; spectroscopy, hydrodynamics, thermodynamics, kinetics, and computational methods applied to protein and nucleic acid systems.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 685. Special Topics in Biochemistry****1-3 Units****Prerequisite(s):** CHEM 547, or CHEM 647, or consent of instructor.**Description:** Recent developments in selected areas of Biochemistry.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 687. Molecular Spectroscopy****3 Units****Prerequisite(s):** CHEM 561 or CHEM 660.**Description:** Molecular structure and interactions as determined by spectroscopic investigation. Rotational, vibrational and electronic spectroscopy as determined by ultraviolet, visible, infrared, microwave and radio frequency methods. Fundamental theory and experimental methods.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 688. X-Ray Crystallography and Its Application to Molecular Structure****3 Units****Prerequisite(s):** CHEM 561 or CHEM 660.**Description:** Crystal structure analysis. Topics include: symmetry, space groups, data collection, structure solution and refinement, structural analysis and presentation of scientific results.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 691. Research****1-9 Units****Prerequisite(s):** 30 semester hours of undergraduate chemistry.**Description:** Individual research with faculty member.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 692. Research****1-9 Units****Prerequisite(s):** 30 semester hours of undergraduate chemistry.**Description:** Individual research with faculty member.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)**CHEM 695. Seminar****1-3 Units****Grading Basis:** Pass/Fail**Description:** Required of all graduate students during residency. Students present one literature and one research seminar by the end of the 3rd semester; participate/attend in department seminar.**Note:** Maximum credit allowed is 3 semester hours.For class offerings for a specific term, refer to the Schedule of Classes (<http://htmlaccess.louisville.edu/classSchedule/setupSearchClassSchedule.cfm>)