

Course Guide for Incoming Students

Chemistry Department, UW-Madison

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To aid incoming students in choosing their first semester courses, the Graduate Student-Faculty Liaison Committee (GSFLC) has worked with the faculty to compile this list of courses that professors recommend for their students. Though efforts have been made to keep this list up-to-date, take note that it may not be definitive or complete. This guide is intended to complement, not replace, direct conversations with PI's and current group members about suggested courses. For instance, course suggestions may vary within a lab, depending on project areas. Also note that some courses may not be offered every semester. Courses are listed by pathway.

Trisha Andrew: *Organic Synthesis, Device Engineering, Renewable Energy, Nanomaterials, Lithography*

Common Pathways: Organic, Materials, Physical

Materials: 641, 842, 621 or 664, 630 (nanomaterials)

Organic: 641, 843 (if available), 714 (organic emphasis), 842

Physical: 621, 641, 675, 661, 842

Analytical: 621, 630, 641, 842

John Berry: *Structure and Bonding in Transition Metal Compounds*

Common Pathways: Inorganic

Any Path: 606, 613, 636, 637, 714, 775, 801

Tim Bertram: *Atmospheric chemistry, chemical reactions at atmospheric interfaces, field measurements of trace gases and aerosol*

Common Pathways: Physical, Analytical

Physical: 675, 628, 625, 762, 777 ATM OCN 630, ATM OCN 535, ATM OCN 630

Analytical: 621, 628, 762, Phys 625, ATM OCN 630, ATM OCN 535, Teach course 327/329 or 524

Helen Blackwell: *Chemical biology, organic chemistry, bacterial communication pathways, anti-infectives, symbioses, small molecule probes*

Common Pathways: Organic, Chem. Bio.

Organic: 641, 843 (if available), 636, Biochem 704

Chem. Bio.: 641, 843 (if available), 636, Biochem 704, Microbio 612

Thomas Brunold: *Spectroscopy and computations of bioinorganic systems*

Common Pathways: Physical, Inorganic, Chem. Bio.

Physical: 661, 675, 608, 606

Inorganic: 608, 713, 675, 606

Chem. Bio.: 675, 608, 665, 606

Steve Burke: *Organic synthesis, Natural products total synthesis, Organometallic chemistry, Asymmetric Catalysis*

Common Pathways: Organic, Chem. Bio.

Any Path: 641, 841, 842 (when appropriate), 843, 636, 605, 713 or 714

Judith Burstyn: *Allostery, biological gas sensing, heme protein structure and function*

Common Pathways: Physical, Inorganic, Analytical, Chem. Bio

Physical: 606, 608, 665, 763, 801 (Bioinorganic), Biochem 625

Analytical: 622, 801 (Bioinorganic), Biochem 625

Inorganic: 606, 608, 801 (Bioinorganic), Biochem 625

Chem. Bio.: 622, 801 (Bioinorganic), Biochem 612, Biochem 625

Other: Biochem 601, Biochem 612, Biochem 620, Biochem 625, Biochem 704

Silvia Cavagnero: *Biophysical spectroscopy (laser-driven NMR, fluorescence), protein folding in vitro and in the cell, molecular chaperones, protein folding/misfolding and disease*

Common Pathways: Physical, Chem. Bio., Analytical, Organic

Physical: 675, 661, 668, 665, 621

Chem. Bio.: 665, 668, Biochem 612, Biochem 704, 872 (Bio semin.)

Analytical: 621, 622, 665, 860, 668

Organic: 636, 843, 637, 665, 668

Project Specific: NMR—636, 637, 668, Biochem 800, Biochem 801, BME 710 (BME semin.)

Fluorescence—668, BME 601 (Bio Microsc.), BME 619 (Microsc. Life)

Biochemistry—Biochem 612, Biochem 704, Chem 872, Biochem 710 (Biochem Funct.)

Kyoung-Shin Choi: *Electrode and catalyst materials for electrochemical and photoelectrochemical applications (solar energy conversion)*

Common Pathways: Materials, Analytical, Inorganic

Materials: 621, 630, 624

Analytical: 621, 630, 624

Inorganic: 608, 630, 624

Josh Coon: *Biological mass spectrometry, instrumentation, informatics*

Common Pathways: Analytical, Chem. Bio., Biomolecular Chemistry, Physical

Any Path: 621, 622, 627, 628, 630, Biochem 601, Biochem 620, Biochem 660, Oncology 675, Stat 571, Comp Sci 302, Comp Sci 367

Fleming Crim: *Molecular reaction dynamics in gases and liquids*

Common Pathways: Physical

Physical: 661, 675

Qiang Cui: *Computational modeling of biomolecular systems and theory development*

Common Pathways: Physical

Any Path: 661, 675, 775, 860, 864

Recommended Physics courses: Classical Mechanics (Phys711), E&M (Phys721), Solid state physics (Phys551)

Materials science courses of interest: MSE760 (complementary to Chem860)

Depending on research interest, several math classes such as Math 707 are also valuable.

Mark Ediger: *Glasses, polymers, surfaces/interfaces, dynamics, nanomaterials*

Common Pathways: Physical, Materials, Analytical

Physical: 675, 661, 777, 664

Materials: 630, 842, 664

Analytical: 621, 630, 623

Danny Fredrickson: *Origins of structural complexity in alloys*

Common Pathways: Inorganic, Materials, Physical

Any Path: 608, 675, 613, 630

Etienne Garand: *Spectroscopy of reactive intermediates and non-covalent complexes*

Common Pathways: Physical

Any Path: 623, 628, 638, 661, 675, 762, 775

Ying Ge: *Biological mass spectrometry, proteomics, cardiac systems biology*

Common Pathways: Analytical, Chem. Bio., Cell and Regenerative Biology, Molecular Pharmacology

Any Path: 622 or 627, 619, 628, 638, PHY675 (section 026, #56351), Oncology 675, Biochem 630, Biochem 660, Stat 301*, Stat 571* (*Optional)

Sam Gellman: *Synthesis, structure and function of proteins and protein mimics, bioactive polymers, asymmetric catalysis*

Common Pathways: Organic, Chem. Bio., Materials, Physical

Physical: 636, 665, Biochem 701

Materials: 636, 665, Biochem 701

Organic: 641, 843 (if available), 841, 605, 636, Biochem 701

Chem. Bio.: 641, 843 (if available), 841, 605, 636, Biochem 701

Pupa Gilbert: *Biomaterials and their formation mechanisms*

Common Pathways: Physical, Materials

Any Path: 608, 668, MS&E 803 (advanced X-ray scattering), Physics 103-104, Physics 109

Randall Goldsmith: *Single molecule spectroscopy of chemical and biochemical dynamics, catalysis, nanophotonics, microfluidics, synthesis, instrument building*

Common Pathways: Materials, Physical, Inorganic, Analytical, Biophysics/Chem. Bio., Organic

Materials: 675, 623, 654

Physical: 675, 661, 623

Inorganic: 647, 675, 619, 641

Analytical: 675, 623, 621

Chem. Bio: 665, 623, 619

Biophysics: 665, 623, 619

Organic: 647, 636, 619, 641

Padma Gopalan: *Nano-scale organization via block copolymers, electronics & photonics materials, directed-assembly*

Common Pathways: Materials Science & Engineering, ...

Ive Hermans: *Sustainable chemistry and catalysis engineering*

Common Pathways: Materials, Inorganic, Physical, Organic

Any Path: 777, 630, 606, 801, 605, 636

Robert Hamers: *Surfaces/interfaces, nanomaterials, renewable energy, and biomaterials*

Common Pathways: Physical, Materials, Analytical, Chem. Bio.

Physical: 675, 661, 630

Materials: 630, 621, 624

Analytical: 621, 630, 624

Inorganic: 630, 608, 624

Chem. Bio.: 621, 630

Other: 630

Richard Hsung: [3 + 3] *Hetero-annulations, allenamides & ynamides, cyclic acetals, natural products, asymmetric catalysis*

Common Pathways: Pharmacy, ...

Song Jin: *Nanomaterials, renewable energy, solid state chemistry, biotechnology*

Common Pathways: Materials, Physical, Analytical, Chem. Bio., Inorganic

Materials: 630, 608, 624 MSE 748, PHY 551, MSE 448

Physical: 675, 661, 630, 777

Analytical: 621, 630, 624

Inorganic: 630, 608, 624

Chem. Bio.: 630, 665

Other: 630

Frank Keutsch: *Atmospheric chemistry and field instrument development*

Common Pathways: Physical, Analytical

Physical: 675, 628, 625, 762, 777 ATM OCN 630, ATM OCN 535, ATM OCN 630

Analytical: 621, 628, 762, Phys 625, ATM OCN 630, ATM OCN 535, Teach course 327/329 or 524

Laura Kiessling: *Chemical synthesis of bioactive compounds, synthesis and function of multivalent ligands and biomaterials, chemical biology*

Common Pathways: Organic, Chem. Bio., Analytical, Physical

Organic: 843, 641, Biochem 704

Any Path: Biochem 704

Thomas Kuech: *Advanced Materials Synthesis and Processing, Electronic and Optoelectronic Devices and Properties, Materials for Energy, Materials by Design*

Common Pathways: Materials, Physical

Physical: 675, 630, CBE 710

Materials: 630, 621, 624, CBE 544

Analytical: 621, 630, 624, 628, CBE 575

Inorganic: 630, 608, 624

Chem. Bio.: 621, 630

Other: 630

Clark Landis: *Catalysis, hydroformylation, organometallics, and real-time kinetic measurements*

Common Pathways: Inorganic, Organic

Any Path: 636, 637, 605, 714, 801, 641, 841, 613

Lingjun Li: *Biological mass spectrometry, proteomics, neuroscience, informatics*

Common Pathways: Analytical, Chem. Bio., Pharmaceutical

Any Path: 622, 630, 621, 625, 607, 628, Biochem 601, Biochem 620, Biochem 660, Oncology 675, Stat 301, Stat 71, Zoology 523, Biomolec Chem 710, Biomolec Chem 711

David Lynn: *Soft Materials, polymers, surfaces & interfaces, nanotechnology, biotechnology*

Common Pathways: Materials, Organic, Chem. Bio

Any Path: 636, 641, 654, 664, 777, CBE 540

Mahesh Mahanthappa: *Polymers, liquid crystals, self-assembly, energy materials*

Common Pathways: Materials, Organic, Analytical, Physical

Analytical: 624, 630, 654, 664
Materials: 613, 624, 630, 654, 664, 842
Organic: 605, 641, 654, 661, 664, 777
Physical: 661, 664, 675, 777

Bob McMahon: *Astrochemistry, photochemistry, and spectroscopy of reactive intermediates*

Common Pathways: Organic, Physical,

Any Path: 605, 608, 636, 641, 714 (organic emphasis) or 661, 661, 675, 775 (physical emphasis)

Sandro Mecozzi: *Nanomedicine, self-assembling nanomaterials, molecular recognition and bioorganic chemistry of RNA.*

Common Pathways: Organic, Physical, Materials, Chem. Bio.

Organic: 605, 641, 766, 841, 843
Physical: 661, 675, 775, 864
Materials: 641, 664, 754, 766
Chem. Bio. : 605, 641, 766, Biochem 704

Cathy Middlecamp: *Intersection of science, people, culture, and the planet*

Common Pathways: Environmental Studies, ...

Gil Nathanson: *Molecular beam scattering experiments to investigate gas/liquid interactions and aerosols*

Common Pathways: Physical

Any Path: 661, 675, 775

Joel Pedersen: *Environmental organic and biophysical chemistry, biomolecule interactions with nanomaterials*

Common Pathways: Analytical, Chem. Bio.

Analytical: 621, 622, 636, CEE 502/631, 609, 631
Chem. Bio.: 636, 637, 665, Biochem 704, CEE 502/631

Ron Raines: *Chemical Biology, Protein Chemistry, Peptide Chemistry, Enzymology, Organocatalysis, Biofuels*

Common Pathways: Physical, Organic, Chem. Bio.

Chem. Bio.: 605, 636, 641, 766, 843 (if available), Biochem 704
Organic: 605, 636, 641, 766, 841, 843 (if available), Biochem 704
Physical: 636, 665, 766, 775, Biochem 704

Tom Record: *Biophysical studies of the kinetics and mechanism of transcription initiation by RNA Polymerase and of noncovalent interactions of biochemical functional groups in water*

Common Pathways: Physical, Chem. Bio., others (including Biochemistry and Biophysics)

Any Path: 661 or 665, Biochem 601 or 612, or other biophysical courses

JR Schmidt: *Development of theoretical tools to study fundamental and applied research questions in energy and catalysis*

Common Pathways: Physical

Physical: 675, 661

Jen Schomaker: *New methodologies for synthesis, development of new catalysts for oxidative cyclization reactions, total synthesis of natural products*

Common Pathways: Organic, Chem. Bio, Inorganic.

Any Path: 641, 841, 842 (if available), 843, 636, 605, 714 or 713

David Schwartz: *Investigation of single molecule phenomena in biological systems*

Common Pathways: Analytical

Any Path: Any genomics or computer science course

Ned Sibert: *Quantum dynamics and spectroscopy*

Common Pathways: Physical

Any Path: 661, 675, 775

Jim Skinner: *Vibrational spectroscopy of water and proteins*

Common Pathways: Physical

Physical: 661, 675, 665

Lloyd Smith: *Development of novel methods and approaches for the analysis and manipulation of biomolecules*

Common Pathways: Analytical, Chem. Bio.

Analytical: 621, 622, 625, 626, 627, 628

Any Path: Biochem 601, Biochem 612, Biochem 620, Stat 571, Comp Sci 302, Comp Sci 367

Shannon Stahl: *Catalysis, mechanism, organometallics, renewable energy, and organic synthesis*

Common Pathways: Inorganic, Organic, Materials

Organic: 641, 714, 843, 636

Inorganic: 608, 713, 714, 636

Materials: 608, 713, 630, 624

Eric Strieter: *Chemistry and biology of protein ubiquitination and degradation*

Common Pathways: Organic, Chem. Bio.

Physical: 665

Biochemistry: 620, 624, 702, 703, 704

Organic: 641, 842

Chem. Bio.: Biochem 704

Weiping Tang: *Development of transition metal-catalyzed new reactions, total synthesis of natural products, and medicinal chemistry*

Common Pathways: Organic, Chem. Bio., Inorganic

Any Path: 636, 641, 714, 841, 843

Doug Weibel: *Chemical biology, organic synthesis, bioanalytical chemistry, microtechnology*

Common Pathways: Physical, Organic, Chem. Bio.

Chem. Bio.: 605, 636, 641, 766, 843 (if available), Biochem 704

Organic: 605, 636, 641, 766, 841, 843 (if available), Biochem 704

Physical: 636, 665, 766, 775, Biochem 704

Jim Weisshaar: *Real-time imaging of biomolecular activity in live cells*

Common Pathways: Physical, Analytical, Chem. Bio.

Physical: 661, 662

Analytical: 628

Chem. Bio.: 860 (Biophysical Spectroscopy), BSE601

Any Path: 665, Bact 612

John Wright: *Laser spectroscopy, nonlinear spectroscopy, spectroscopy of nanostructures, photocatalysis*

Common Pathways: Physical, Analytical, Materials

Analytical: 621, 623, 628

Any Path: 661, 675, 775

Arun Yethiraj: *Multiscale modeling of complex fluids*

Common Pathways: Physical

Any Path: 661, 675, 664

Tehshik Yoon: *Synthesis and Catalysis*

Common Pathways: Inorganic, Organic

Any Path: 636, 641, 714, 843

Lian Yu: *Polymorphism of organic materials, crystallization of organic glasses, molecular motions in organic solids*

Common Pathways: Pharmacy, ...

Martin Zanni: *Ultrafast spectroscopies to study topics in biophysics and materials science*

Common Pathways: Physical, Chem Bio, Materials

Physical: 661, 675

Chem Bio: 665

Materials: 630, 621, 624

Chemistry Department Courses

605 Spectrochemical Measurements. 3 cr. Mass spectrometry and applied nuclear magnetic resonance. Two lecture sessions, or lectures, and one problem session per week. P: Chem 562 or cons inst.

606 Physical Methods for Structure Determination. 1-3 cr. A survey of spectroscopic methods for inorganic structure determination. This course will introduce the major non-crystallographic techniques with an emphasis on the application to structural analysis. The basic theory and methodology of each form of spectroscopy will be presented. Topics covered include: ligand field theory, electronic absorption, IR/Raman, Mossbauer and EPR spectroscopies, and magnetic susceptibility. P: Chem 511 & 562 or cons inst. Chem 608 or equiv recommended.

607 Laboratory Safety. 1 cr. Aspects of laboratory safety relating to chemical, electrical, optical, mechanical, cryogenic and radiological hazards will be discussed. Safety equipment, techniques (including first aid), and facilities will be introduced. P: Chem 346 or cons inst.

608 Symmetry, Bonding, and Molecular Shapes. 1-3 cr. This course provides a solid background in elementary bonding theory and its application to understanding molecular geometry and reactivity. The course emphasizes qualitative methods applied to the bonding of elements from throughout the periodic table. P: Grad st or cons inst.

613 Chemical Crystallography. 3 cr. Theory of structural chemistry, experimental methods involved, applications to problems of chemical interest; use of diffractometric equipment and computer data analysis for an actual structure determination. P: Chem 562 or cons inst.

619 Microscopy of Life. (Crosslisted with Physics, Anatomy, BME, Med Phys, Phmcol-M, Radiol) 3 cr. Survey of state of the art microscopic, cellular and molecular imaging techniques, beginning with subcellular microscopy and finishing with whole animal imaging. P: 2nd semester intro physics including light & optics (e.g. 104, 202, 208) or cons inst.

621 Instrumental Analysis. 3-4 cr. Chemical instrumentation, spectrochemical, electrochemical and other methods of instrumental analysis; lecture and lab. P: Cr or con reg in Chem 561 or cons inst.

622 Organic Analysis. Alt yrs; II; 2 cr (P-A). Methods and underlying theory of functional group analysis. *Pre-Reqs:* Chem 345 & 524 or cons inst.

623 Experimental Spectroscopy. 2-3 cr. The theory behind current spectroscopic methods employed in chemical analysis with applications in atomic and molecular absorption spectroscopy, infrared and Raman vibrational spectroscopy, fluorescence and light scattering; lecture and laboratory projects. P: Chem 562 or cons inst.

624 Electrochemistry. 2-3 cr. Theory of interfacial electron transfer and mass transport processes in electrochemistry, with applications to electroanalysis, electrodeposition and electrochemical separations; lecture and laboratory projects. P: Grad st or cons inst.

625 Separations in Chemical Analysis. 2-3 cr. Fundamentals of transport processes and the origins of chemical potential differences giving rise to separation. Principles of chromatography, electrophoresis and field flow fractionation. Lecture and laboratory projects. P: 1 sem organic & 1 sem phys chem, or cons inst.

626 Genomic Science. Alt yrs; 2 cr (P-A). This course is designed to bring cutting-edge topics in the genomic sciences into the reach of traditionally "pure" chemistry, biology, engineering, computer science & statistics students. It is also designed for enabling biologically-oriented students to deal with the advances in analytical science so that they may incorporate new genomic science concepts into their own scientific repertoires. Intended for graduate students and for undergraduates with extensive research experience. *Pre-Reqs:* Graduate student standing or instructor consent.

628 Chemical Instrumentation: Design and Control Applications. 3 cr. The design and application of chemical instrumentation; basic principles for monitoring and controlling chemical experiments; optical, electrical and mechanical sensors and transducers of importance to analytical chemical instrumentation; lecture and lab. P: Chem 524, 621 or cons inst.

630 Environmental Chemistry. Frank Keutsch's environmental course, and some Analytical topics.

636 Topics in Chemical Instrumentation: Introduction to NMR. 2 cr. This course will instruct students on the theory and practice of NMR spectroscopy. It is a full semester course, consisting of 15 hours of lecture and 30 hours laboratory instruction. P: Cons inst. Enrollment will be limited based on avail instrumentation for lab exercises.

637 Topics in Chemical Instrumentation: Advanced Methods in NMR. 1-2 cr. This course will instruct students on advanced methods of NMR spectroscopy. It is offered as a seven week module, consisting of 7 hours of lecture, 14 hours of laboratory instruction, 1 hour final exam. P: Cons inst. Enrollment will be limited based on avail instrumentation for lab exercises.

638 Topics in Chemical Instrumentation: Introduction to Mass Spectrometry. 1 cr. This course will introduce students to the theory and practice of mass spectrometry. It is offered as a 7 week module, consisting of 15 hours of lecture and laboratory instruction. P: Cons inst. Enrollment will be limited based on avail instrumentation for lab exercises.

641 Advanced Organic Chemistry. 3 cr. Topics in physical organic chemistry. P: Chem 345 or cons inst.

652 Selected Topics Focus: Chemistry of Inorganic Materials. (Previously numbered Chem 630 Fall.)

653 Selected Topics Focus: Nanoscale Materials. (Previously numbered Chem 630 Spring.)

654 Materials Chemistry of Polymers. 2-3 cr. Polymer classification, synthesis, and molecular architecture; solid state structure and characterization; glassy state and glass transition; polymer rheology in solids and gels; transport, dielectric and optical properties. P: Chem 562 or cons inst.

661 Chemical and Statistical Thermodynamics. 3 cr. Basic chemical thermodynamics with applications to chemical and phase equilibria and the study of solutions; introduction to statistical mechanics and calculation of thermodynamic quantities from molecular models; stability and fluctuations. P: Chem 561 or 565, & Chem 562; or cons inst.

664 Physical Chemistry of Macromolecules. 2-3 cr. Structure, thermodynamics, and dynamics of polymers in solution and in the bulk; theoretical models and experimental methods; polymer characterization. P: Chem 562 or cons inst.

665 Biophysical Chemistry. (Crosslisted with Biochem) 4 cr. Chemical thermodynamics, chemical kinetics and transport properties, with applications to the energetics and mechanisms of protein and nucleic acid processes in aqueous solution. Taught together with Chemistry 565. P: Undergraduate calculus-based physics, analytical chemistry, undergraduate biochemistry or molecular biology.

668 Biophysical spectroscopy.

675 Introductory Quantum Chemistry. 3 cr. Basic principles of quantum chemistry, exactly solvable problems, angular momentum, approximation methods, applications to electronic structure. P: Chem 562 or cons inst.

699 Directed Study. 1-6 cr. P: Jr or Sr st. Graded on a lettered basis; requires cons inst.

713 Chemistry of the Elements. 1-3 cr. A course on descriptive chemistry of the elements with a focus on large scale/industrial processes. P: Chem 511 or equiv.

714 Organometallic Chemistry of the Transition Elements. 2-3 cr. P: Chem 511 or cons inst.

725 Structural Theories of Fluid Dynamics. (Crosslisted with CBE, EMA) 3 cr. Interconnection between fluid structure and bulk flow properties, kinetic theory of polymer solutions, polymer melts, suspensions and emulsions, deduction of rheological constitutive equations, Brownian motion. Configuration-space and phase-space kinetic theory. P: Grad st in CBE or cons inst.

762 Molecular Reaction Dynamics. 2-3 cr. Microscopic approach to chemical dynamics in gasses and liquids. P: Chem 562 or cons inst.

763 Introduction to Molecular Spectroscopy. 2-3 cr. Quantum mechanics of molecular rotation and vibration; principles of group theory; electronic, vibrational, and magnetic resonance spectroscopy in gas and condensed phases. P: Chem 675 or cons inst.

766 Molecular Recognition. (Crosslisted with Phm Sci) 2-3 cr. Origin, nature, classification, and description of intermolecular forces. The hydrophobic effect. Molecular complexes, binding constants, and their measurements. General principles of self-assembly, molecular recognition, complex formation, host design. Supramolecular systems and their dynamics. Micelles, bilayers, vesicles, biological membranes. P: Chem 561 or equiv physical chem or cons inst.

775 Electronic Structure of Molecules. 2-3 cr. Applications of quantum mechanics to the electronic structure and properties of molecules. P: Chem 675 or cons inst.

777 Physical Chemistry of Surfaces. 2-3 cr. Structure, thermodynamics, kinetics, and reactivity of molecules at the interfaces between gases, liquids and solids, with applications to catalysis, atmospheric chemistry, monolayers, and thin films. P: Chem 562 or cons inst.

801 Selected Topics in Inorganic Chemistry. 1-3 cr. P: Cons inst.

841 Advanced Organic Chemistry. 3 cr. Synthesis of simple and complex organic compounds. P: Chem 641.

842 Advanced Organic Chemistry. 1-3 cr. Selected topics. P: Cons inst.

843 Advanced Organic Chemistry. 1-3 cr. P: Cons inst.

845 Bioorganic Chemistry. 2-3 cr. Chemical structure and reactivity of biological molecules. P: Chem 641, Biochem 602, or cons inst.

860 Selected Topics in Physical Chemistry. 1-3 cr. P: Grad st.

864 Statistical Mechanics. 2-3 cr. Fundamentals of statistical mechanics; applications to equilibrium and non-equilibrium properties of gases and condensed phases; selected advanced topics. P: Chem 661 & 675 or cons inst.

872 Selected Topics in Macromolecular and Biophysical Chemistry. (Crosslisted with Biochem) 1-3 cr. P: Grad st.

875 Advanced Topics in Quantum Chemistry. 2-3 cr. Advanced methods and special topics in quantum chemistry. P: Chem 675 or cons inst.