Inorganic Chemistry

CHM1202H *Selected Current Directions in Inorganic Chemistry*
The course will be given by a visiting scholar of unique expertise. Students will gain insight into a field that is highly specialized and of growing importance. While the course will be essentially 'lecture' style, presentations by students will be part of the course.

CHM1204H *Organometallic Chemistry*
(Cross-listed undergrad CHM432H)

CHM1205H *Inorganic Reaction Mechanisms*
This course focuses on modern theory of inorganic reaction mechanisms. Topics covered include:
- Formal kinetics and rate laws; transition state theory; activation parameters
- Modern experimental techniques
- Introduction into computational methods
- New discoveries in ligand substitution
- Recent findings for oxidative addition/reductive elimination
- Electron transfer mechanisms
- Inorganic Photochemistry
- Mechanisms of selected important homogeneous reactions

CHM1206H *Solid State Chemistry: Structure-Property Reactions*
(Cross-listed undergrad CHM434H)

CHM1258H *Reactions of Coordinated Ligands*
Study of how the reactions at coordinated ligands change as the ligands, metal and metal oxidation state are changed. This knowledge provides insight into the functioning of homogenous catalysts. The material is based mainly on articles from journals.The preparation for this course would be undergraduate course(s) covering organometallic and transition metal chemistry.

CHM1261H *Topics in Inorganic Chemistry I*
Inorganic Chemistry faculty members will present current topics that span the breadth of the field Inorganic Chemistry: Materials, Main group, Transition Metal, Organometallic, Catalytic, Biological, and Physical. Each topic will be covered in 4 h of lectures. The topics will be different from those of CHM1270HS "Frontiers in Inorganic Chemistry" so that students can take both courses if they wish. **Prerequisite:** Comprehensive course(s) in Inorganic Chemistry at the undergraduate level. Either CHM1261HS or CHM1270HS is a required core course for the Inorganic Chemistry program for students entering with a BSc.

CHM1266H *Physical Methods in Inorganic Chemistry* *(NEW in 2013-2014)*
This course will teach the arsenal of physical techniques used to characterize structure and properties of inorganic compounds. Emphasis is on mainstream techniques and how they can be used to solve a research question. Practical use, with examples of solved problems forms the basis for this course, and theoretical background will be, for the purpose of this course, kept to a minimum. Homework and final exam questions will be mostly data (for example spectra) that might arise from a real-life research situation and which the student has to be able to correctly interpret. Instead of an in-depth treatment of a particular technique, it is intended to teach a very wide range of techniques. The following is a list of techniques that are being considered for this course:

- Solution phase, multinuclear NMR spectroscopy
- Solid-state, multinuclear NMR spectroscopy
- X-ray-based spectroscopies: XPS, EXAFS
- Electron Paramagnetic Resonance (EPR, also known as ESR)
- Electrochemistry
- UV-Vis spectroscopy
- Vibrational Spectroscopy (Infrared and Raman)
- Fundamentals and use of computational techniques, in particular DFT (Density Functional Theory)
- Mössbauer spectroscopy
- X-ray crystallography; elementary

CHM1263H ***Bioinorganic Chemistry***
(Cross-listed Undergraduate CHM437H)

CHM1268H ***X-ray Crystallography***
An introduction to single crystal X-ray crystallography as a method of determining the structure of small molecules. The principal theme will be a description of the X-ray experiment from obtaining the crystal through to publishing the final structure. The objective of the course is to give students a working knowledge of the single crystal X-ray experiment. This will allow students to become more involved in the X-ray experiment and to read the crystallographic literature intelligently. Introduction to Crystals and Symmetry. Space groups (Triclinic, P2, P21, C2, Pc,P21/c, orthorhombic, tetragonal, others). Miller Indices, Reciprocal Lattices, and Diffraction. Intensity of Scattered X-rays, Data Acquisition, Data Reduction, and Structure Factors. Structure Solution, Structure Refinement, Evaluation of a Crystal Structure. **Reference Text:** *Structure Determination by X-ray Crystallography* , M.F.C. Ladd and R.A. Palmer, Plenum Press.

CHM1269H ***Nanochemistry-A Chemistry Approach to Nanomaterials***
Course Instructor : Geoffrey A. Ozin **Course Description** : A chemistry approach to nanomaterials is presented through the eye of chemistry. The goal is to provide a leading-edge description of the emerging and exciting field of nanochemistry. The content of the course has been selected and organized to establish the basic principles of nanoscience through the subject of nanochemistry. Because of the interdisciplinary non-mathematical approach adopted in teaching this course the lecture material should be useful to a broad student interest group. To amplify, nanoscience today involves bottom-up chemistry and top-down engineering physics techniques or a creative amalgamation of both. We are currently witnessing an explosion of novel ideas and strategies for making and manipulating, visualizing and interrogating nanoscale materials and structures. An aim of this course is to describe the concepts and methods, developed mainly by chemists, for synthesizing a range of nanoscale building blocks with strictly controlled size, shape and surface functionality, structure, composition and properties. A further aim is to explain how these nanoscale construction units can be organized and integrated into functional architectures, both simple and complex, using a combination of self-assembly and directed self-assembly using chemical lithography and template based methods. Nanochemistry will be a valuable course for students planning an academic or industrial research career in any area related to nanoscience and nanotechnology. It provides a global perspective of the subject of nanochemistry, written with sufficient breadth and depth to make it suitable as the basis of a final year undergraduate course or a graduate course for students in chemistry and physics, materials science and engineering, biology and medicine. This course will provide a readily accessible road map of nanochemistry, beginning with its roots and extending to its branches, emphasizing throughout the connection of ideas from discovery to application, from within and between the science disciplines. It provides a unique perspective through chemistry, which will make it invaluable for those witnessing, participating in, and trying to remain at the forefront of the nanoscience and nanotechnology explosion. The course material is designed to get students excited and thinking about nanochemistry, and what they can do with it. **Course Textbook** : Nanochemistry: A Chemical Approach to Nanomaterials, Geoffrey A. Ozin and Andre Arsenau, Royal Society of Chemistry, 2005. **Prerequisite:** CHM434H or an equivalent course in solid state chemistry.

CHM1270H ***Frontiers in Inorganic Chemistry***
Inorganic Chemistry faculty members will present exciting current topics that span the breadth of the field Inorganic Chemistry: Materials, Main group, Transition Metal, Organometallic, Catalytic, Biological, and Physical. Each topic will be covered in 4 h of lectures. The topics will be different from those of CHM1261H "Topics in Inorganic Chemistry I" so that students can take both courses if they wish. **Prerequisite:** Comprehensive course(s) in Inorganic Chemistry at the undergraduate level. Either CHM1261H or CHM1270H is a required core course for the Inorganic Chemistry program for students entering with a BSc.

CHM1290Y *Inorganic Chemistry Seminar*