Organic and Biological Chemistry

CHM1003H *Physical Organic Chemistry II*
(Cross-listed undergrad CHM443H)

CHM1004H *Synthetic Organic Chemistry*
(Cross-listed undergrad CHM440H)

CHM1005H *Applications of Spectroscopy in Organic Structure Determination*
(Cross-listed undergrad CHM441H)

CHM1006H *Bioorganic Chemistry*
(Cross-listed undergrad CHM447H)

CHM1008H *Biological Chemistry*
(Cross-listed undergrad CHM479H)

CHM1051H (formerly CHM1009H) *Current Topics in Chemical Biology*
Protein-protein interactions are critical for biological processes. In addition to providing a fundamental understanding of molecular mechanisms involved in recognition, studies of protein interactions also provide a potential avenue for molecular therapeutics. This course will cover current approaches for disrupting protein interactions in medically relevant systems. In addition, we will present some fundamental techniques for studying protein interactions and the effect of therapeutics on these interactions. The specific topics will vary, depending on the interests of the faculty and students, but could include HIV inhibitors, as well as proteomimetic, peptidomimetic, and small molecule approaches to cancer therapy. Students in this course will gain a fundamental understanding of all aspects of research in an emerging field in drug development, namely the use of molecular therapeutics to disrupt protein-protein interactions. The course focuses on many aspects of drug development, including discovery of essential protein-protein interactions, selection of specific protein complexes as targets, and drug design. Prerequisite: CHM379H or permission of the instructor.

CHM1040H *Modern Organic Synthesis*
The course consists of two parts: A) *Transition Metal Catalysis*, and B) *Reactive Intermediates*. In the first part of the course, we will discuss transition metal-catalyzed transformations for carbon-carbon bond formation. Aspects of reaction development, catalyst design and mechanistic information will be discussed. Selected topics (tentative) will include i) basic concepts in transition metal catalysis, ii) palladium-catalyzed cross-couplings and modern developments in this area, iii) C-H bond functionalization reactions, iv) Heck reactions, v) alkyl cross-couplings, and vi) sustainability in transition metal catalysis. In the second part of the course we will outline various aspects of the chemistry of reactive intermediates, including radicals, cations, carbenes, nitrenes, ketenes and benzynes.

CHM1045H *Modern Physical Organic Chemistry*
Mechanistic studies on reactions of interest to organic chemists will be investigated (C-C bond formation, catalytic mechanisms, stereoselectivity etc. discussed in publications by for example, E. Jacobsen, S. L. Buchwald, J. F. Hartwig, G. Fu, P. Guthrie, D. Evans, E. Carreira etc.).

CHM1054H *Topics in Bioorganic Chemistry*
Recommended Preparation: Students should be familiar with concepts in reaction mechanisms (as in CHM 348 or equivalent). Knowledge of biochemistry (such as CHM 379H) and bio-organic mechanisms (such as CHM 447) is especially useful background. **Content:** The course will consider topics that include mechanisms of biological group transfer processes, mechanisms of catalysis by enzymes, coenzymes, and ribozymes, origins of specificity.

CHM1055Y *Organic Proposal Defense*
Third year students in the Ph.D. program for organic chemistry will write an independent research proposal. The students will defend their proposal during an oral presentation to a committee of faculty members. Evaluations and feedback will be given based on both the oral defense and the written proposal.

CHM1056H *Techniques for Studying the Chemical, Structural and Dynamic Properties of Biomolecules*
This course will cover current techniques for studying the structure, chemical properties, and mobility of biological molecules. Techniques will be described in terms of theory and application and will provide a fundamental understanding of the information potential and limitations of each technique. The specific topics will vary, depending on the interests of the faculty and students, but could include mass spectrometry, nuclear magnetic resonance spectroscopy, fluorescence spectroscopy, molecular modeling and calorimetry.

The course will be team-taught by faculty from St. George, UTSC and UTM. Students will be responsible for short (15-20 minute) presentations at the end of the course, expanding on specific topics covered in the course. In the spirit of the tri-campus system, lectures will be taught at the campus where each faculty member is located.

CHM1057H *Selected Topics in Organic Chemistry*
This section of the course will cover non-lines effects and ligand accelerated catalysis, domino reactions and recent advances in medicinal chemistry.

CHM1059H *Chemical Biology in Complex Systems*
Chemical biology is providing new methods to visualize and quantify processes in intact model organisms. The course will focus on discussion and critiques of the most recent research in chemical biology. Students will develop proposals for new research in the area and go through the peer review process of their ideas. This course is best suited to doctoral students in their second or higher years.

CHM1060H *Advanced Topics in Synthetic Organic Chemistry*
Organopalladium Chemistry and Asymmetric Synthesis. Total Synthesis (mainly of alkaloids), discussing miscellaneous synthetic methods (e.g., iminium ions, free radicals) and biosynthetic aspects as appropriate.

CHM1068H *Topics in Biological and Medicinal Chemistry*
The course will focus on the use of chemical approaches for answering key biological questions. Topics will include the design of fluorescent probes, the design of inhibitors and reporters of cell function, chemical genetics, caged compounds, techniques for chemical modification of proteins inclduing non-natural amino acid mutagenesis, expansion of the genetic code, combinatorial approaches to the design of proteins and small bioactive compounds, protein design, protein folding and stability, and biological cell-based assays for drug design.

CHM1090Y *Organic Chemistry Seminar*