School of Chemistry
Master of Science by Coursework
Chemistry subject modules - 2009

610-681 Advanced Spectroscopy: (2 modules to be selected)

Module 1: Advanced Structural Elucidation – Richard O'Hair and Frances Separovic
This module explores the fundamentals of structure determination as applied to organic and biological molecules, focussing on methods such as NMR and mass spectrometry. The combination of background theory and range of examples will enhance students' ability to acquire and analyse experimental data.

Module 2: Chemical Applications of Synchrotron Radiation – Charles Young
This module will discuss the principles, instrumentation and applications of synchrotron radiation, particularly in the X-ray region of the electromagnetic spectrum. Examples will be drawn from chemical and biochemical systems, and applications to advanced materials and processes.

Module 3: Electronic Structure and Spectra – Stephen Best
This module will explore the application of symmetry to the interpretation of various spectroscopic techniques (absorption, emission, vibronic structure, CD, MCD), in order to determine the structure of, for example, metal complexes.

610-682 Chemistry 4A: (2 modules to be selected)

Module 1: Advanced Organic Synthesis – Mark Rizzacasa
This module will outline some of the major methods of organic synthesis including asymmetric aldol and related reactions, sigmatropic rearrangements and metal-catalysed transformations. Applications in the synthesis of important chiral molecules will be discussed.

Module 2: Free Radicals in Synthesis – Carl Schiesser
This module will outline the fundamental steps important to radical chain chemistry and show how these principles can be used in the total synthesis of important molecular frameworks.

Module 3: Lasers in Chemistry – Evan Bieske and Trevor Smith
This module will discuss general principles of laser action, the properties of laser beams, some specific types of lasers, laser-based spectroscopic methods, laser photochemistry, ultrafast lasers, and lasers in mass spectrometry.

Module 4: Advanced Materials and Materials Characterisation - Rachel Caruso
This module will explore advanced materials such as porous materials, nanomaterials, and materials for clean energy. Common materials characterisation techniques, such as electron microscopy, powder X-ray diffraction, thermal analysis and gas sorption, will be studied.

Module 5: Magnetism in Chemistry - Colette Boskovic
This module will explore magnetochemistry in the context of isolated spins, discrete spin clusters and extended systems. Areas covered will include magnetic susceptibility, the mechanisms of magnetic exchange interactions, long range ordering in extended solids, spin crossover complexes and single-molecule magnets.

610-683 Chemistry 4B: (2 modules to be selected)

Module 1: Automatic Chemical Analysis – Spas Kolev
This course will outline advanced methods in the automation of chemical analysis based on the use of batch, robotic and flow analysers. There will be a particular emphasis on flow injection and sequential injection analysis, focussing on clinical, industrial and environmental applications.

Module 2: Interfacial Chemistry and Sonochemistry – Muthupandian Ashokkumar and Franz Grieser
This module will study the production of nanometer-size colloids of metals, polymers and semiconductor particles using ultrasound, and how surface-active solutes affect the yield of the particles produced. The use of sonochemistry to decompose organic pollutants such as PCBs will also be discussed.

Module 3: Advanced Physical Organic Chemistry – Jonathan White
This module will explore the interrelationships between structure and reactivity in organic molecules. Topics such as substituent effects, linear free energy relationships and the Hammett equation will be applied to the determination of organic reaction mechanisms.

Module 4: Photochemistry and Electrochemistry in Synthesis – Uta Wille
This module will explore the application of photochemistry and electrochemistry in synthesis, focussing on reactive intermediates (e.g. radicals and ions) which are accessible only with difficulty using standard methods. Applications of these techniques in chemical synthesis will be presented.

Module 5: Biological and Medicinal Chemistry – Craig Hutton and Spencer Williams
This module will explore modern drug design principles, as well as the molecular basis of therapeutic activity and methods of synthesis of various drugs. Case studies will be used to highlight the discovery and development of important drug classes.