Environmental Chemistry

CHM1401H *Transport and Fate of Chemical Species in the Environment*
Introduction to the physical environment. Fundamentals of chemical kinetics. Gas-phase reactions. Reactions in the environment. Reactions in the environment. Reactions in the environment. Chemical thermodynamics. Photochemistry. Environmental influences on chemistry. Phase partitioning. Phase partitioning. Sorption of organic contaminants to soils and sediments. NMR or OM characterization.

CHM1404H *Molecular Analysis of Natural Systems*
The course will encourage students to consider how they can utilize traditional and emerging analytical chemistry techniques synergistically and design new analytical approaches to address the role of complex systems in the environment. It will introduce environmental applications of NMR spectroscopy, hyphenated NMR, imaging and related computation techniques (prediction, simulation, elucidation), such that students have a basic grasp of the subjects, and can relate the potential of the approaches to their own research. The emphasis will be on environmental applications and not theory.

CHM1410H *Analytical Environmental Chemistry*
(Cross-listed Undergraduate CHM410H)
CHM410H is an analytical theory, instrumental, and methodology course focused on the measurement of trace concentrations of pollutants in soil, water, air, and biological tissues. The course will begin with techniques involved with obtaining a representative sample, data analysis and handling, and a detailed look at sample preparation (extraction, clean-up, concentration, derivitization) which will be followed by extensive theory and application of the techniques of gas chromatography, liquid chromatography, immunochemistry, atomic spectrophotometry, electrochemistry, and mass spectrometry. Discussion sessions will pursue integrative material. Lab sessions will allow students to directly apply lecture material in hands-on experimentation using all the modern analytical instrumentation utilized in modern measurement science. The lab sessions will utilize the new ANALEST facility featuring state-of-the-art gas, liquid, and ion chromatographs, atomic absorption, and inductively coupled plasma emission (ICP) spectrophotometry. Students will be involved in field measurements as part of the laboratory exercise.

CHM1415H *Atmospheric Chemistry*
(Cross-listed Undergraduate CHM415H)
This course considers the chemistry occurring in the Earth's atmosphere, with emphasis on developing a molecular-level understanding of the photochemistry, free-radical kinetics, and heterogeneous chemistry that occurs. Topics include stratospheric ozone depletion, trace gas oxidation, urban air pollution, acid rain, and the connections between aerosols and climate.

CHM1420H *Environmental Chemistry of Soil*
This course will explore advanced topics in the structure and environmental reactivity of soils and sediments. Students will gain an appreciation for application of thermodynamic principals to open, natural systems. The structure, characterization, and analytical research methods for the mineral and non-living organic fractions in soils and sediments will be covered in detail. **Instructor:** Myrna Simpson

CHM1425H *Modelling the Fate of Organic Chemicals in the Environment*
This course will give an introduction to quantitative approaches to describing the behaviour of organic chemicals in the environment. Building upon a quantitative treatment of equilibrium partitioning and kinetically controlled transfer processes of organic compounds between gaseous, liquid and solid phases of environmental significance, it will be shown how to build, use, and evaluate simulation models of organic chemical fate in the environment. The course will provide hands-on experience with a variety of such models.

CHM1430H *Advanced Topics in Atmospheric Chemistry*
Through lectures, assigned readings and student-led discussions, this course will address several issues of current concern in atmospheric chemistry. The specific topics will vary by year and instructor, but could include heterogeneous chemistry, unimolecular and 3-body reactions, particle formation and growth, chemistry-climate interactions and inclusion of chemistry in atmospheric dynamical models.

CHM1550H *Topics in Environmental Chemistry*
This course will cover a range of topics of current interest in environmental chemistry. The specific topics will be determined each time the course is offered.

EES1105H *Soil Contamination Chemistry*
This course presents fundamental chemical concepts and reactions that occur in soils with emphasis on contaminant behavior. The basics of soil chemistry will be introduced and the processes that relate to: quantities, attenuation, sequestration, and movement of ions, heavy metals, and organic molecules in terrestrial environments will be addressed in detail. Students will become familiar with geochemical computer models and these models will be used to predict the behavior of ions in soil. Soil chemical characteristics, which can be used to predict the fate of contaminants in terrestrial environments, will also be presented.

CHM1590Y *Environmental Chemistry Seminar*