

Course outline for CHM C11. "Introduction to Instrumental Analysis"

An introduction to the workings and application of modern analytical instrumentation. A range of modern instrumentation including NMR spectroscopy, Mass Spectrometry, Microscopy, Light Spectroscopy (Visible, Ultra Violet., Infrared, Fluorescence, Phosphorescence), X-ray, Chromatography and electrochemical separations will be addressed. Principles of measurement; detection of photons, electrons and ions; instrument and experiment design and application; noise reduction techniques and signal-to-noise optimization will be covered

This will be a lecturer based course with additional tutorials. To promote the interest of student in analytical chemistry, a guest lecturer will be invited to focus on the "real – world" applications of instrumental analysis through a 1 hours lecture follow by a 30 minutes of Q/A periods. Lastly, for each assignment, a case study will be provided to promote scientific discussion amongst students. At the end of every unit, I will bring the student to the TRACES lab to see the instrument and do a demonstration on a test sample. This will allow them to apply their knowledge, allowing them to see the operation of some of the instrument discussed in class.

A group assignment will be given out in class. This assignment will be based on a real life problem in which student will have to apply their knowledge in analytical chemistry. The problem will revolved around bioanalytical analysis such as detection of cocaine in the blood or isolation of crystal meth in urine. The student will have to work in group and they have to present an analytical technique appropriate for their analysis. This exercise not only promote the interest of student in chemistry but also allowing them to work on their presentation skills, which is critical in today`s work place. **I will also incorporate a software called understoodit (<http://understoodit.com/>), which is developed at UofT in order to gauge student`s involvement.**

Assessment will be through

- 3 x Assignments 30%
- Group Presentation 5%
- 1 Mid Term Test = 25% (in class)
- 1 Final Exam = 40%

Review of fundamental physical chemistry concepts (1.5 week)

Basic intermolecular interactions
Chemical equilibrium
Basic Quantum Mechanics
Basic Thermodynamics concepts

Atomic Detectors (1.5 week)

Atomic Spectroscopy
Atomic Emission
Atomic Mass Spectroscopy

Molecular Detectors (3 weeks)

Ultraviolet Visible Spectroscopy
Fourier Transform Infrared Spectroscopy
Nuclear Magnetic Resonance Spectroscopy
Mass Spectrometry
Luminescence,
Phosphorescence and Fluorescence.

Separations (3 weeks)

Gas Chromatography
High Pressure Liquid Chromatography
Capillary Electrophoresis

Advanced Hyphenated Analytical Instruments 1 (3 weeks)

GC-MS
LC-MS
LC-NMR-MS
LC-SPE-NMR-MS

CHMC11 Resources

Your textbook:

Principles of Instrumental Analysis 6th Edition. Douglas A. Skoog, F. James Holler, Stanley R. Crouch.

CONTACTS

I can be reach via email: ronald.soong@utoronto.ca
My office hours schedule will be posted on the intranet prior to the start of the semester.