University of Toronto Mississauga

CHM1103F Advanced Topics in Analytical Chemistry, Fall 2018

Instructor: Ulrich J. Krull – DV3216, (905) 828-5437
E-mail: ulrich.krull@utoronto.ca

Text: No required textbook; various sources and readings will be recommended

Lecture: M/W 12-1pm, DV 1160
Tutorial: R 10-11am, DV2094C (**Starting Sept 13**)
Office Hours: M 2-3pm; DV3216 (and by appointment)

MARKING SCHEME FOR GRADUATE STUDENTS, CHM1103F

Class presentation/participation	15%
Term Test (Oct 17, 2018)	10%
Essay (due in class Dec 5, 2018)	45%
Exam (TBA Dec 8-21)	30%

Note: Late penalties: 10% of value of assignment/business day

Issues associated with illness, pandemic or other absence:

1. Requests for special consideration due to absence can be submitted up to one week after an assignment deadline by 5pm of that day. Extension of this deadline will only be considered if the student is incapacitated past the one-week deadline. Within one week of the date of the missed work, students should submit to the course instructor a signed letter explaining the reason for their absence. The letter should include the student's name, phone number, email address, student number and lab/tutorial section number as well as the date of and the description of the missed work. A doctor's note or other appropriate documentation regarding the absence should be stapled to the letter.

If the explanation for the missed work is deemed reasonable after verification of the documentation, the final exam mark will be used as the mark for the missed work. If the explanation is considered unreasonable or no letter is submitted within one week of the missed work, a mark of zero will be assigned for the missed work.

2. Students must request special consideration by means of Email to the course instructor.

3. Supporting documentation required in addition to a ACORN absence declaration must be supplied in person. Absence due to illness requires a UofT medical certificate. All supporting documents will be examined to determine whether special consideration is granted.

In a circumstance such as an outbreak of illness that affects many in the class, then alternatives in terms of lecture delivery, due dates and marking scheme will be arranged to support all members of the class.

Equity Statement

The University of Toronto is committed to equity and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect. As a course instructor, I will neither condone nor tolerate behaviour that undermines the dignity or self-esteem of any individual in this course and wish to be alerted to any attempt to create an intimidating or hostile environment. It is our collective responsibility to create a space that is inclusive and welcomes discussion. Discrimination, harassment and hate speech will not be tolerated. If you have any questions, comments, or concerns you may contact the UTM Equity and Diversity officer at edo.utm@utoronto.ca or the University of Toronto Mississauga Students' Union Vice President Equity at vpequity@utmsu.ca.

Course Topics

Approx. Duration

Information Theory and Chemometrics – Tools of the Trade

a) Major topics of chemometrics, Factor analysis, Multiple regression, Pattern analysis
b) Informing Power
c) Simplex optimization
d) Deconvolution methods
e) Neural networks
f) Computers and interfacing — 3 hours

HIGH ENERGY TECHNIQUES

X-Ray Photoelectron Spectroscopy (Electron Spectroscopy for Chemical Analysis)

a) Binding energies
b) Chemical shifts
c) Shake-up, shake-off processes
d) Multiplet splitting
e) Angularly resolved spectra and depth profiling — 3 hours

Auger Electron Spectroscopy

a) Energy levels and transitions
b) Electrostatic interactions and coupling
c) Chemical shifts
d) Quantitative and empirical approaches — 2 hours

Mass Spectrometry

a) Fragmentation pathways – theoretical approach
b) Fast instruments; Quadrupole and Time-of-Flight (TOF)
c) Fourier transform instruments
d) Interfacing to chromatography and the atmosphere
e) Specialized ion sources – Matrix Assisted Laser Desorption Ionization (MALDI) 3 hours

Secondary Ion Mass Spectrometry

a) Static and dynamic SIMS
b) Types of ion source
c) Time-of Flight instruments
d) Angularly resolved spectra and depth profiling 3 hours

LOW ENERGY TECHNIQUES

Infrared and UV-visible Spectroscopies

a) Properties of light at an interface, absorption and scattering processes and techniques
b) External reflectance
c) Surface Enhanced Raman spectroscopy
d) Near-field methods; Total internal reflectance fluorescence, Resonance Energy Transfer
e) SPR, SERS and LSPR; applications of plasmon resonance 9 hours