

CHMC11HF

Principles of Analytical Instrumentation

FALL 2023 COURSE SYLLABUS

Course Objective

To describe and introduce the fundamentals of Analytical Instrumentation. 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.

Learning Outcomes

By the end of the course, students will be familiar with the theory behind, and practical uses of, modern analytical instrumentation. Students will be able to select the ideal type of instrumentation for analysis in research and industry settings. Students will understand the advantages of disadvantages of each class of instrument, including safety consideration, cost of ownership and cost of operation, so they can make informed decisions in their future careers.

Course Instructors

Prof. Andre Simpson, e-mail: andre.simpson@utoronto.ca

Course location and time : Thursday 2-5pm MW120

Optional Text: Students are strongly encouraged to reiterate what they learn in the lectures with the relevant sections from the following textbook:

Principles of Instrumental Analysis, Skoog *6th Edition*..

PLEASE DOWNLOAD AND PRINT THE LECTURE MATERIAL BEFORE YOU COME TO EACH CLASS FROM BLACKBOARD. THERE WILL BE SPECIAL “EASY PRINT” FORMAT. BRING THE NOTES SO YOU CAN ADD TO THEM DURING CLASS

Evaluation:

1 Mid Term Quiz = 25%

1 Term Paper = 25%

1 Final Exam = 50%

Course Policies and General Information:

Course Announcements: Announcements, updates to readings, assignment topics, requirements, and evaluation, etc. will be posted to the course site. Students are responsible for checking the course website regularly. **Please, arrange your UTORONTO emails to accept the course announcements.**

Office Hours: Students are welcome to ask questions or resolve course-related problems by contacting the Course Instructor either by dropping in during scheduled office hours or by making an appointment. Students are responsible for work missed as a result of absence; the Course Instructors will not re-teach material covered in the lectures and lab sessions.

Prof. Andre Simpson, e-mail: andre.simpson@utoronto.ca

Office hours: Thurs 12-2 pm in the Environmental NMR Centre/Office (SY050 or SY324)

Missed Mid-term Test: The exact dates of the mid-term tests are provided in the Course Topics schedule. Students who miss the term test will be assigned a mark of zero for the test, unless they can document a compelling reason for missing it. Students in that position must submit a written request to the Course Instructor with appropriate documentation. If a request is accepted for the mid-term test, the weighting of the mid-term will be included to the final exam. There will be no make-up mid-term tests.

Final Examination: The final examination will take place during the UTSC examination period in December following the end of the course. The exact date will be provided when the examination is scheduled.

Late Term Paper:

You have over 2 months to complete the term paper which is set in week 1. It is not possible to offer an extension as the negatively impacts students that start early and plan. The only exception being students when an accommodation has been granted by AccessAbility Services.

Late term papers will have 10% removed per hr they are late, as determined by the submission time on Quercus.

TERM PAPER IS DUE AT 2PM ON NOV 16TH

AccessAbility: Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. The UTSC AccessAbility Services staff (located in **S302**) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca

The sooner you let us know your needs the quicker, we can assist you in achieving your learning goals in this course.

Cell Phones: During lectures and labs please put your cell phones in silent mode to avoid disruption of the class. If circumstances warrant use of your cell phone and you must receive an emergency call, please inform the Course Instructor at the beginning of the session in advance and then excuse yourself from the session to respond to the call outside the lecture hall or laboratory.

Academic Calendar: Further information about academic regulations and course withdrawal deadlines can be found in the UTSC Calendar. You are encouraged to read this material.

Centre for Teaching and Learning: If you need assistance with effective writing skills, study skills, exam preparation, note taking, or time management, free workshops and advice are available from the Centre for Teaching and Learning, which can be reached at:

http://www.utsc.utoronto.ca/~ctl/Student_Support/index.html

Math & Statistics Learning Centre is now offering students help with any sort of questions they may have related to mathematics and statistics. Our course components involve advanced math skills. If the students are struggling, they are encouraged to drop in at AC312 and use the available general help hours. The schedule can be viewed at the link:

<http://ctl.utsc.utoronto.ca/mslc/>

Computer Use: Ethical use of University computers is expected at the University of Toronto Scarborough. Guidelines are set out in the UTSC Calendar. It is expected that the equipment and/or resources accessed in the UTSC Library and the computer labs are to be used for academic research, assignments, and course activities only.

Academic Integrity: Honesty and fairness are considered fundamental to the University's mission, and, as a result, all those who violate those principles are dealt with as if they were damaging the integrity of the University itself. When students are suspected of cheating or a similar academic offence, they are typically surprised at how formally and seriously the matter is dealt with - and how severe the consequences can be if it is determined that cheating did occur. The University of Toronto treats cases of cheating and plagiarism very seriously.

Examples of offences for which you will be penalized include (but are not limited to):

- Using any unauthorized aids on an exam or test (e.g., "cheat sheets")
- Representing someone else's work or words as your own - plagiarism (see web document "How not to plagiarize" available online at <http://www.utoronto.ca/writing/plagsep.html>)
- Falsifying documents or grades
- Purchasing an essay
- Submitting someone else's work as your own
- Submitting the same essay or report in more than one course (without permission)
- Looking at someone else's answers during an exam or test
- Impersonating another person at an exam or test or having someone else impersonate you

- Making up sources or facts for an essay or report.

As a student it is your responsibility to ensure the integrity of your work and to understand what constitutes an academic offence. If you have any concerns that you may be crossing the line, please, read from the website

<http://www.utoronto.ca/academicintegrity/resourcesforstudents.html>

and always consult your instructor. Your instructor can explain, for example, the nuances of plagiarism and how to use secondary sources appropriately; he or she will also tell you what kinds of aids - calculators, dictionaries, etc. - are permitted in a test or exam. Ignorance of the rules does not excuse cheating or plagiarism.

“Normally, students will be required to submit their course essays to the University’s plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool’s reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University’s use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>).”

Evaluation

1 Mid Term Quiz = 25%

1 Term Paper = 25%

1 Final Exam = 50%

Office Hours

I will be available for office hours 12-2pm Thursdays each week. If you need to meet with me, ***please e-mail me in advance (by Wed 12pm)***. Meetings will have to be kept short 5-10mins in case a larger number of students need to talk with me.

E-mail : andre.simpson@utoronto.ca to make appointment.

C11 Course Overview

Lectures

Week	In-Class Topic	After Class-Tutorial
Sept 7 th	UV-VIS, FT-IR	
Sept 14 th	NMR	NMR Facility Tour
Sept 21 st	NMR (tutorial)	*Main NMR Tutorial-Catchup
Sept 28 th	NMR interactions	Challenge Questions – Tackling some of the largest questions in modern science
Oct 5 th	NMR applications and examples	Fun NMR Quiz
Oct 12 th	Reading Week – No Class	
Oct 19 th	Mid-Term Exam	
Oct 26 th	Atomic Absorption, Luminescence	
Nov 2 nd	Microscopy	
Nov 9 th	Intro Separations, HPLC,	
Nov 16 th	Gas Chromatography, Capillary Electrophoresis	“Beat the Professor Challenge” TERM PAPER DUE BY 2PM
Nov 23 rd	Mass Spectrometry 1	
Nov 30 th	Mass Spectrometry 2 (+Hyphenation)	TRACES Facility Tour
TBA	Final Exam	

These tutorials catch up session are for those struggling with the main NMR tutorial. NOTE it is **critical you attend the main NMR tutorial on Sept 21st. If you do not you could fail the mid term !! This catch up session are only if you are struggling understanding the assignment of 2D NMR data.*