Syllabus for Instrumental Methods of Chemical Analysis

Course Number	**SC/CHEM 3080 4.0; Section M**
Term	**Winter (W)**
Session	**2021-2022**
Prerequisites	**SC/CHEM 2080 4.0; SC/PHYS 1010 or SC/PHYS 1410 or SC/PHYS 1420 (or a strong skillset in linear algebra that can be applied to electronics and optics). Permission from the Course Director is required if prerequisites are not met.**
Course Director	**Dr. Trevor VandenBoer** **Office: CB 344** **Email: profvdb@yorku.ca**
	NOTE: Emails will be responded to as quickly as possible, typically between 09:00-17:00 on weekdays. Do not expect an immediate response to an email on weekends, or even within the same day it is sent, as it may sometimes take up to 3 days to be addressed. **Dr. VandenBoer will respond ONLY to emails which include:** • **The Course Code (CHEM3080) in the Subject Line** • **A professional salutation (e.g. 'Dear Dr. VandenBoer')** • **Your full name and student number as the inquiring student**
Lab Coordinator	**Carolyn Hempstead** **Office: CB 360** **Email: carolynh@yorku.ca**
Lecture Times	**T, R; 10:00 AM; 90 minutes;** **Location (until further notice) will be Zoom:** https://yorku.zoom.us/j/92887928914 **NOTE: Lectures will be delivered live and will be recorded. These recordings will only be available to students enrolled in the course. Students are encouraged to turn on their mic and/or camera and to participate in discussions during class but must understand that it will be recorded.** **Location (in-person; according to YorkU announcemnts) will be:** **CB 121**

Office Hours M; 13:00-14:00; Zoom Room: https://yorku.zoom.us/j/5024903027

Laboratory Room CB 343

Duration is a 3-hour experiment every other week with day and timing based on lab group. All laboratory concerns and conflicts must be addressed with Carolyn.

The labs will start on the week of January 17, 2022 for orientation on the space and expected practices. The printed lab manual and finalized schedules will be available by January 17. Any changes will be announced on eClass.

Labs are performed with the entire group in your lab section. A list of students for each lab section will be made available on eClass.

NOTE 1: You must wear a face mask at all times while in the Chemistry Building and CHEM3080 laboratory. Students are expected to use their own mask, but one will be provided if yours is forgotten. We strongly encourage you to wear a well-fitting N95-rated mask to protect yourself and your peers in addition to standard lab personal protective equipment (lab coat, goggles, gloves). Hand sanitizer is provided throughout the building and at the entry to the laboratory. Adhering to proper hygiene protocols is necessary to create a safe lab environment during the COVID-19 pandemic.

NOTE 2: The laboratory portion of the course represents a significant fraction of your final grade. To complete the experiments and reports to a satisfactory level, you must read and understand the experiment in the lab manual and the background information in the course textbook before coming to the lab. It is possible that you will be performing an instrumental technique before it has been fully covered in the lectures. You must also be comfortable with proper analytical techniques and performing linear regressions, as learned in CHEM 2080. Expect a number of labs to be analyzed using TurnItIn to ensure that the Academic Honesty guidelines of York University are being respected. Any breaches of Academic Honesty will be fully enforced.

Course Texts Principles of Instrumental Analysis 7th Edition by Skoog, Holler, and Crouch

This is available in the York bookstore and as an eBook. Most analytical chemistry textbooks include sections on instrumentation and can be readily substituted. We will not be comprehensively covering the materials in Skoog, Holler, and Crouch, but many relevant practice problems to

prepare for quizzes and the exam are found within. You will be responsible ONLY for topics/concepts covered in class.

Further supporting materials available at Steacie Science Library: Principles of Instrumental Analysis 7th, 6th, and 5th Editions by Skoog, Holler, and Crouch

Student Tools

All students will require the following to participate in the online portions of this course:

- Webcam and/or microphone
- Stable internet connection (or hotspot capabilities for cell data)
- An application to scan assessment documents
- Access to CrowdMark, eClass, and iClicker

Evaluation

Both the theory and laboratory components must be passed in order to pass this course.

There are two grading structures for this course to help stay on top of course materials despite the disrupted learning environment due to the COVID-19 pandemic. These are also offered to help mitigate the numerous challenges of online and/or in-person coursework conducted throughout the course. The two options (all dates are tentative) are as follows:

Option 1 (Default Grading Scheme): Quizzes with Exam

Quizzes (5/6 x 4% = 20%)	Jan 27, Feb 10, Mar 1, Mar 15, Mar 29, Apr 7
iClicker Participation (10%)	Throughout the term
Final Exam (30%)	Date set by registrar's office
Laboratory (40%)	Throughout the term

Option 2: 5/6 Quizzes and No Exam

Quizzes (5/6 x 10% = 50%)	Jan 27, Feb 10, Mar 1, Mar 15, Mar 29, Apr 7
iClicker Participation (10%)	Throughout the term
Laboratory (40%)	Throughout the term

Question sets with practice problems will be provided with example calculations based on theory, as well as concepts from each unit.

Participation will be evaluated through iClicker assignments.

- You must complete all of the iClicker assignments to obtain full participation marks.
- These can be completed during the live lecture or while viewing the lecture on demand.

- The iClicker assignments will be available for a week following the corresponding lectures (or until the end of classes, whichever comes first) to ensure they can be completed.
- The app 'iClicker REEF' can be downloaded for free on your mobile devices and tables, and is also available at app.reef-education.com for laptops.
- York has a free subscription to this app, so do NOT make any purchase (even if prompted).
- Ensure your correct student number is associated with your iClicker account. Failure to do so may mean that your participation is not counted.
- To find iClicker questions, search the CHEM3080 eClass pages. They can be found under the 'Assignments' section.

Quizzes (~45 minutes) will take place approximately every other week, beginning on the third week of class (January 27). Quizzes will consist of questions similar to those assigned during the prior week but can draw on additional calculations and concepts from the associated lecture materials. Your final quiz grade will be based on your 5 highest quiz marks. If you miss 2 or more quizzes, the missed portion of your final grade will be transferred to the mandatory final exam.

All course quizzes and the exam will be conducted online through CrowdMark. Quizzes will be held during the live lecture timeslot. You will be provided with a no-risk practice document download and upload, and an appropriate amount of additional time to upload documents, such that on assessment days you are able to submit on time. Late submissions on assessment days will be penalized at a rate of 1% per minute.

EXAM EXEMPTION: If you complete 5 out of 6 quizzes during the semester, you will be eligible for exemption from writing the final exam (Option 2). If you complete all 6 quizzes, your lowest quiz score will be dropped when your final grade is calculated. If this 5 out of 6 condition is NOT met, you must write the final exam.

NOTE: All students are expected to be available for the complete final exam period. Conflict with previously made travel arrangements is not an acceptable reason for missed exams.

Final Grade The Faculty of Science approved letter grades

NOTE: The numerical grades used throughout the course are only guides for assigning final approved letter grades. Students must keep track of their own numeric grades as values posted on eClass are not guaranteed.

The course director retains the prerogative on how to use numerical grades to assign letter grades. Quiz and laboratory marks are made available to students. However, a final numerical mark is not disclosed to the student.

NOTE 2: Grades are not negotiable. A regrade request can be made using a clear written statement of less than half a page to Prof. VandenBoer outlining the concerns. Regrading may cause your marks to increase, decrease, or stay the same as the entire assessment may be re-evaluated. The resulting grade will be considered final.

Course Content

The course will cover topics pertaining to instrumental chemical analysis. You will be provided the opportunity to learn about a wide variety of modern analytical instrumentation starting from their basic components, their theoretical principles of operation, the organization and workflow of instruments, and practical aspects of performing quantitative analysis with instrumentation.

The material covered will include the following topics and may vary slightly:

1. Introduction to Instruments

2. Calibrations and Method Selection
   - External Calibration
   - Standard Addition
   - Internal Standards

3. Analytical Separations I
   - Separation Theory
   - Gas Chromatography

4. Electrical Components and Circuits
   - Basic Components
   - Operational Amplifiers
   - Digital Electronics
   - Signals and Noise

5. Analytical Spectrophotometry
   - Optical Components
   - Atomic Absorption
   - Atomic Emission
   - Molecular Spectroscopy (UV-Vis)
   - Luminescence Spectroscopy

6. Analytical Separations II
   - Ion Chromatography
   - Liquid Chromatography

7. Electroanalytical Techniques (time permitting)
   - Potentiometry
   - Coulometry

Awareness	Students must make themselves aware of York University policies on Academic Honesty/Integrity, Access/Disability, Student Conduct, Religious Observance and other matters. A periodically updated Information Sheet summarizing this information can be downloaded* and printed, and the Registrar's Office issues a list of Religious Observance Days.‡ * http://secretariat.info.yorku.ca/files/CourseInformationForStudentsAugust20121.pdf ‡ http://registrar.yorku.ca/enrol/dates/religious-accommodation-guidelines-2018-2019

Accessibility and religious accommodations

- Students registered with Accessibility Services must submit accommodation letters to via email to Dr. VandenBoer by January 31, 2022.
- Any religious observance conflicts occurring at any point during the term should be communicated by email to Dr. VandenBoer by January 31, 2022.
- Note: "Senate policy states that students are expected to monitor their progress in courses, taking into account their personal and academic circumstances, and to make the necessary adjustments to their workload to meet the requirements and deadlines." (from Senate Policy of Students' Responsibilities in the Petition/Appeal Processes).
- The drop deadline is March 18, 2022.

Academic honesty

- Any student who breaches York's Academic Honesty Policy will be reported. Some examples of offences include:
  - Plagiarism.
  - Students who misrepresent themselves during iClicker activity, a quiz, or examination or provide documentation for absence from any of these that is not legitimate.
  - Students who submit any material for remarking that has been modified in any manner to misrepresent the original assessment.
- Ignorance of the policies is not an acceptable defense. https://spark.library.yorku.ca/academic-integrity-what-is-academic-integrity/

Academic Honesty and COVID-19

Numerous students in Faculty of Science courses have been charged with academic misconduct when materials they uploaded to third party repository sites (e.g. Course Hero, One Class, etc.) or shared directly were taken and used by known or unknown students in the same or later offerings of the course. The Faculty's Committee on Examinations and Academic Standards (CEAS) found in these cases that the burden of proof in a charge of aiding and abetting had been met, since the uploading (or sharing) students had been found in all cases to be wilfully blind to the reasonable likelihood of supporting plagiarism in this manner. Accordingly, to avoid this risk, students are urged not to upload their work to these sites or to share their course and lab work. Whenever a student submits work obtained through sharing, Course Hero, One Class, etc. the submitting student will be charged with plagiarism and the sharing or uploading student will be charged with aiding and abetting.

Note also that exams, tests, and other assignments are the copyrighted works of the professor assigning them, whether copyright is overtly claimed or not (i.e. whether the © is used or not). Scanning these documents for anything other than completing these assessments constitutes copying, which is a breach of Canadian copyright law, and the breach is aggravated when scans are shared or uploaded to third party repository sites.