

CHEM/ENCH321:**Instrumental Analytical Chemistry
(Winter 2021)**

Instructor: Dr. Zhe She

Instructor Contact Information:

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Important Notice for 2021 winter:

1. OnQ and Microsoft Team will be used for sharing learning materials. Please make sure to always check CHEM ENCH 321 OnQ site for any updates.
2. **Lectures** will be delivered **asynchronously**. Lecture notes and study materials will be posted on OnQ under content.
3. **Some** of our **lecture hours (Mon 1.30 PM, Wed 12.30 PM, Friday 11.30 AM)** will be used to host virtual office hours (with Dr. She) and synchronous tutorial sessions (with course TA). (Tutorial time to be confirmed later.)
4. Some of the examples and past exam or test questions will be discussed during tutorial sessions. **If you have any questions or would like to discuss topics from lecture notes and textbook further, you are encouraged to stop by virtual office hours with Dr. She.**

“In-class” Office Hours: Wednesday (weekly), 12.30 PM to 1.30 PM

(During one of our lecture hours via Microsoft TEAM. A link will be created and posted on OnQ weekly. We have many small technical details associated with methods we are learning. It is easier to clarify these quickly by virtual discussion.)

Optional “in-class” tutorials are not weekly. They will be scheduled during the term and details will be posted on OnQ. Tutorial examples/solutions will be made available to all. You are strongly encouraged to attend the tutorials. **In-person discussions, clarification of questions and details are very beneficial for understanding the course material.**

Intended Student Learning Outcomes:

- Understand several separation techniques commonly used in (bio-)analytical chemistry.
- Compare and discuss detection methods and their strength and limitations.
- Investigate how different instrumental analysis techniques are applied in real-life applications during the literature report exercise.

Course Outline

1.) Introduction to Chromatography Liquid-Liquid Extraction, Partition Coefficient TLC, Resolution, Van Deemter Equation, Sources of Band Broadening, Selectivity Factor, Capacity Factor, Theoretical plates, Qualitative and Quantitative Analysis.

2.) Gas Chromatography: Injectors, Split, Splitless and on-column injection, Silanization, Columns, Packed vs. Capillary, Common stationary phases, Classification of Stationary Phases, Kovats Retention Index, McReynolds Constants, Temperature Programming, Detectors, ECD, FID, TCD, Mass Spectrometry. GC sample Prep., Purge and Trap, Solid Phase Micro-extraction, Headspace sampling.

3.) HPLC: Instrument Components: injectors, high pressure pumps, solvent gradients, guard columns, analytical columns, common stationary phases (reversed and normal phase, bonded, coated, pellicular), elutropic series, detectors, UV-Vis, Fluorescence, Refractive Index, developing and optimizing an HPLC separation.

4.) Electrophoresis, Capillary Electrophoresis, size exclusion chromatography, chiral separation.

5.) Detection methods: Electrochemical Analysis: Coulometric Analysis, Voltammetry, Diffusion Current, Polarography, Anodic Stripping, electrochemical biosensors.

Textbooks/Readings

Preferred: Quantitative Chemical Analysis, 9th edition, Daniel C. Harris

Grading Scheme

Midterm	25%
Literature Review Report	20%
Assignments (Two)	10% (i.e. 5% each)
Final Exam	45%

Midterm will be hosted on-line on the 26th Feb, 2021

More information will be provided during the term on OnQ site.

Grading Method

All components of this course will receive numerical percentage marks. The final grade you receive for the course will be derived by converting your numerical course average to a letter grade according to Queen's Official Grade Conversion Scale:

Queen's Official Grade Conversion Scale

Grade	Numerical Course Average (Range)
A+	90-100
A	85-89
A-	80-84
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	57-59
D	53-56
D-	50-52
F	49 and below

Late Policy

Assignment and report submission details will be posted on OnQ

Please submit your work on time. Late submission is subject to a 15 % /day late penalty (i.e. mark – number of days x 15%).

Location and Timing of Final Examinations

The exam dates for each Term are listed on the Faculty of Arts and Science webpage under “Important Dates.” Student exam schedules for the Winter Term are posted on the Friday before Reading Week. **Students should delay finalizing any travel plans until after the examination schedule has been posted. Exams will not be moved or deferred to accommodate employment, travel/holiday plans or flight reservations.**

Academic Integrity

Academic Integrity is constituted by the six core fundamental values of honesty, trust, fairness, respect, responsibility and courage (see www.academicintegrity.org). These values are central to the building, nurturing and sustaining of an academic community in which all members of the community will thrive. Adherence to the values expressed through academic integrity forms a foundation for the "freedom of inquiry and exchange of ideas" essential to the intellectual life of the University (see the Senate Report on Principles and Priorities <http://www.queensu.ca/secretariat/policies/senate/report-principles-and-priorities>).

Students are responsible for familiarizing themselves with the regulations concerning academic integrity and for ensuring that their assignments conform to the principles of academic integrity. Information on academic integrity is available in the Arts and Science Calendar (see Academic Regulation 1 <http://www.queensu.ca/artsci/academic-calendars/regulations/academic-regulations/regulation-1>), on the Arts and Science website (see <http://www.queensu.ca/artsci/academics/undergraduate/academic-integrity>), and from the instructor of this course. Departures from academic integrity include plagiarism, use of unauthorized materials, facilitation, forgery and falsification, and are antithetical to the development of an academic community at Queen's. Given the seriousness of these matters, actions which contravene the regulation on academic integrity carry sanctions that can range from a warning or the loss of grades on an assignment to the failure of a course to a requirement to withdraw from the university.

Calculator Policy

As noted in Academic Regulation 9.2, “Calculators acceptable for use during quizzes, tests and examinations are intended to support the basic calculating functions required by most Arts and Science courses. For this purpose, the use of the **Casio 991 series calculator** is permitted and is the only approved calculator for Arts and Science students.”

Copyright of Course Materials

“This material is designed for use as part of CHEM/ENCH321: Instrumental Analytical Chemistry at Queen's University and is the property of the instructor unless otherwise stated. Third party copyrighted materials (such as book chapters and articles) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law.

Copying this material for distribution (e.g. uploading material to a commercial third-party website) can lead to a violation of Copyright law. Find out more about copyright here:

<http://library.queensu.ca/copyright>.”

Accommodations for Disabilities

Queen's University is committed to achieving full accessibility for people with disabilities. Part of this commitment includes arranging academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. The Senate Policy for Accommodations for Students with Disabilities was approved at Senate in November 2016 (see <https://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslclwww/files/files/policies/senate-andtrustees/ACADACCOMMPOLICY2016.pdf>). If you are a student with a disability and think you may need academic accommodations, you are strongly encouraged to contact the Queen's Student Accessibility Services (QSAS) and register as early as possible. For more information, including important deadlines, please visit the QSAS website at: <http://www.queensu.ca/studentwellness/accessibility-services/>

Academic Considerations for Students in Extenuating Circumstances

Queen's University is committed to providing academic consideration to students experiencing extenuating circumstances that are beyond their control and are interfering with their ability to complete academic requirements related to a course for a short period of time, not to exceed three months. Students receiving academic consideration must meet all essential requirements of a course. The Senate Policy on Academic Consideration for Students in Extenuating Circumstances was approved at Senate in April, 2017 (see <http://www.queensu.ca/secretariat/sites/webpublish.queensu.ca.uslclwww/files/files/policies/senateandtrustees/Academic%20Considerations%20for%20Extenuating%20Circumstances%20Policy%20Final.pdf>) Each Faculty has developed a protocol to provide a consistent and equitable approach in dealing with requests for academic consideration for students facing extenuating circumstances. Arts and Science undergraduate students can find the Faculty of Arts and Science protocol and the portal where a request can be submitted at: <http://www.queensu.ca/artsci/accommodations>. Students in other Faculties and Schools who are enrolled in this course should refer to the protocol for their home Faculty.

If you need to request academic consideration for this course, you will be required to provide the name and email address of the instructor/coordinator.

Please use the following:

Instructor/Coordinator Name: Dr. Zhe She

Instructor/Coordinator email address: zs22@queensu.ca