

Chem 4472A/9472A Course Outline

1. Course Information

Course Information

This joint undergraduate and graduate course, Advanced Analytical Chemistry (Chem 4472A/9472A), has hands-on lectures 10:20 am-11:20 am on Mondays, Wednesdays, Fridays in the Fall semester in room ChB 115. Tutorials are available via Zoom 2:00-3:30 pm every Wednesday. Other tutorials are available in Zoom and in person by making appointments.

List of Prerequisites

Unless you have either the prerequisites (chemistry 3372B or the former chemistry 362B, 322 while 4472, 9472 are crosslisting and antirequisite courses for graduate students for this course) or written special permission from the Department of Chemistry to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructors	Email	Office	Phone	Office Hours
Dr. Zhifeng Ding	zfding@uwo.ca	MSA0203	86161	2:00-3:30 pm Wednesday

Students must use their Western (@uwo.ca) email addresses when contacting their instructors.

3. Course Syllabus, Schedule, Delivery Mode

This joint undergraduate and graduate course encompasses selected topics at the advanced level of analytical sciences. They include simulations for electroanalytical chemistry, analytical instrumentation and their applications to research, computer titrations, advanced electrochemistry for analysis.

Learning outcomes

1. Knowledge of analytical instrumentation
2. Analytical simulation fundamentals
3. Computer titration essentials
4. Modern electroanalytical chemistry

5. Applications of modern analytical chemistry

In-class labs: There are plenty in-class labs with software: LabVIEW, COMSOL and Excel.
(Please be prompt and bring your laptop for all classes).

PRELIMINARY LECTURE SEQUENCE 2025-2026

1. Introduction

- Operation of the course
- The first experiments:
- Check your computer and software installation
- Electronic Mail
- Midterm Exams, the Final Exam-presentation.

approximate number of lectures:

1 lecture

2. Simulations for Electroanalytical chemistry

- Introduction to COMSOL software.
- Cyclic Voltammetry.

7 lectures

3. Analytical Instrumentation

- Introduction to LabVIEW.
- Data acquisition.
- Instrument Control.
- Data Analysis

7 lectures

4. Presentation

9:30-12:30 on Saturday, October 18, 2025

5. Computer Titrations

- Aqueous Solutions and Chemical Equilibria.
- Titrimetric Methods; Precipitation Titrimetry.
- Neutralization Titrations.
- Complexation Reactions and Titrations.

8 lectures

6. Electroanalytical Chemistry

- Introduction to Electrochemistry.
- Applications of Standard Electrode Potentials.
- Applications of Oxidation/Reduction Titrations.
- Potentiometry.
- Voltammetry.

6 lectures

IMPORTANT DATES	
First Lecture in the winter semester	Friday, September 5, 2025 – 10:30 am in CHB 115
Last Winter Lecture -	Earlier than Monday, December 9, 2025

Presentation Day: 9:30-12:30, October 18, 2025 in room ChB 115

Fall Reading Week: November 3 – 9, 2025

Exam period: December 11 – 22, 2025

4. Course Materials

Required materials: In-class handout and OWL PDF materials. Several reference textbooks might be reserved in Taylor Library. Please bring a laptop in class. No textbook is required. We only have the teaching license for LabVIEW, COMSOL. **By taking this course, we have your consent to use the software only for this course, NOT for any other purposes.**

Mobile Device or iClicker:

- Audience response systems (“clickers”) will be used to provide immediate feedback on your understanding of course concepts. You will require a web - enabled device (phone, laptop, etc.) or an iClicker (not recommended). Participation marks are awarded for the use of “clickers”. You must use your own “clicker” account and may not submit responses for any other student. The data collected using the devices will not be used for research purposes without your consent.

All course material will be posted to OWL: <https://westernu.brightspace.com/>

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Assignments (6)	36%
“Clickers” participation	4%
Midterm Test	25%
Presentation	35%
NO Final Exam	

Tests and exam schedule		
Midterm (Open Book)	(25%)	6:30 pm-8:30 pm, Wednesday, November 26, 2025
Materials: computer titrations		Location ChB 115 - make sure you check here:
6 assignments	(36%)	Will be announced in class during the course
Clickers	(4%)	In-class clickers
Project presentation	(35%)	9:30 am-12:30 pm, Saturday, October 18, 2025; Location ChB 115

Marked on participation only. The score you receive will be based on the percentage of questions answered:
80% or more = 4; 70–79% = 3; 60–69% = 2; 40–59% = 1; Less than 40% = 0
There is NO makeup for iClicker questions

★★ THERE ARE NO MAKE-UPS FOR in-class LABS★★

- Exam are short answer questions.

Chem 4472A Presentation Guidelines

1. The presentation will be on Saturday, October 18th, 2025, 9:30 am -12:30 pm in room 115. **Everyone has to be there all the time; otherwise a penalty will be applied.** In the event of illness or emergency, usual procedures will apply.
2. The presentation will be 12 min (maximum) for each student and 3 min questions follow. The duration depends on the number of students.
3. At the end of the presentation event, please return the NI USB 6008 devices, the voltmeter and the tool. Otherwise, your presentation marks will not be released.
4. Choose a topic on instrumentation based on LabVIEW or on simulation based on COMSOL. You are encouraged to select a project which is related to your 4491E or graduate thesis.

The scientific level should be equivalent to chem 3372b poster, less high than your 4491 project or chem 9658/9567 seminar for graduate student, but higher than 4472 assignments. Please come to Dr. Ding's office to discuss your choice if needed.

For LabVIEW topic, please study the CV6008.vi I have deposited in OWL. Basically the VI uses one of the two sub VIs I showed in class: 4472ai.vi to do data acquisition (recording the electrochem current and potential, as we call it as passive usage of the AD/DA converter); 4472ao.vi to drive an experiment, as we call it as active usage of the AD/DA converter. For example, switch on your light source or high voltage and then switch off, integrate the detection signals within certain time, sweep a

potential etc. You should have data acquisition, data analysis and data presentation in your VI you are going to make. Note that the device number may change with your USB device (NI 6008) and your computer.

Sure, you can do a simulation project with COMSOL. For instance, as we explained in the class, you can simulate a cyclic voltammogram for a species which can be reduced and oxidized. You can also simulate a voltammogram for a species which has an electrochemical reaction at the electrode and then the reduced species or the oxidized species can go for a chemical reaction (EC mechanism).

The project you are going to do is by no means limited to the examples describe above.

Highlights of the presentation

Title and outline of your talk

INTRODUCTION describes the background to the instrument or simulation.

MATERIALS & METHODS what you prepared; what instrument you used; what you did. Might include a schematic diagram and/or photo of the instrument.

Or, what is your model of simulation.

RESULTS of your measurement or simulation

DISCUSSION can be the analyzed results

- DISCUSSION OF a RESEARCH PAPER or BOOK FROM THE LITERATURE, or the present situation/problems...Summarize what was done, may be include a diagram of best results.

- REFERENCES here must be a list (short) or key references -books -research papers that you used -best to use numbers (1) etc. in the text

- ACKNOWLEDGEMENTS who helped -who you wish to thank -financial support

- It is required to present a paper and it is a good idea to select a paper with topic related to your 4491 project or graduate thesis. It will make your presentation more focused and coherent.)

You must decide on your choice of the title by Wednesday, October 15, 2025 and e-mail to zfding@uwo.ca.

Use of Generative AI Tools

Generative AI tools (e.g., ChatGPT, Copilot, Gemini) are **not allowed** for each assessment and open-book test.

General information about missed coursework

Students must familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf,

This policy does not apply to requests for Academic Consideration submitted for **attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request **without supporting documentation** in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Practical in-class laboratory practice
- Midterm/Presentation/Group Project designated by the instructor as the one assessment that always requires documentation when requesting Academic Consideration.

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above or those in the **Coursework with Assessment Flexibility** section below, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

Students who are unable to meet their academic responsibilities due to medical or compassionate reasons may submit a request for academic consideration. For each missed piece of work **worth 10% or more** of the total course grade, you must apply for such consideration by providing valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration. For each missed or late assignment (a piece of work **worth less than 10%** of the total course grade), you do not need to provide medical documentation or contact the Academic Counselling Office, but you must send a written explanation of your absence to the instructor to be excused. Note that *all* accommodations for missed work, regardless of who grants them, are subject to the *Conditions required to pass the course*.

Accommodation for students with disabilities. Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. In cases where a student misses a piece of work for reasons related to the disability on file with Accessible Education, the student should request accommodation by contacting Accessible Education instead of the Academic Counselling Office.

Missed assignments. There are no make-up assignments. If you miss an assignment and are granted accommodation, the weight of the missed assignment will be transferred to the other ones.

Missed midterm test. If you miss a midterm test and are granted accommodation, a make-up test will be offered. If you miss the make-up midterm test and are excused as well, apply for Incomplete Standing (a grade of INC).

Late assignments. All assignments and lab reports must be submitted by the due date. Late submissions will be accepted for 24 hours after the due date without penalty, but will be rejected afterwards. Students who miss the automatically extended deadline and ask the instructor for accommodation will be excused. Students with applicable accommodations recommended by Accessible Education can request a longer one-time deadline extension. To preserve the integrity of evaluation, this extension cannot exceed 7 days after the regular due date because graded assignments will normally be returned by that time. Students with disability accommodations who ask for a longer extension will be excused instead, subject to the *Conditions required to pass the course*.

Essential Learning Requirements

The assignments and midterm exam are essential components of the course. You must submit at least 4 of the 6 assignments, finish and present your project in a group, and write the midterm test. Students who fail to meet any of these requirements without academic accommodation for the missed work will receive a course grade of not greater than 40%, even if the calculated grade is higher. A student who is unable to submit the required minimum number of assignments for medical or compassionate reasons, and who wishes to complete the missed work, will need to apply for Incomplete Standing (a grade of INC) by submitting a written request to the Dean of the Faculty of Registration. If Incomplete Standing is granted, the student will be able to complete the missed items the next time the course is offered. A student who is unable to write the midterm must apply for permission to write a makeup that will be one week after the midterm.

6. Additional Statements

6.1 Religious Accommodation

When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request an accommodation for their absence in writing to the course instructor and/or the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible, but not later than two weeks prior to the writing of the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays - <https://www.edi.uwo.ca>

6.2 Academic Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

6.3 General Academic Policies

The website for Registrar Services is <https://www.registrar.uwo.ca/>.

Use of @uwo.ca email: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address.

It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

Requests for Relief (formally known as “appeals”)

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec/pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

Procedures on Request for Relief from Academic Decision (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_requests_for_relief_procedure.pdf

6.4 Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Procedures on Scholastic Offences (Graduate):

https://uwo.ca/univsec/pdf/academic_policies/appeals/graduate_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a *scholastic offence*, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers

submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

6.5 Support Services

Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, requests for relief, exam conflicts, and many other academic-related matters: <https://www.uwo.ca/sci/counselling/>.

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence (GBSV) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced GBSV (either recently or in the past), you will find information about support services for survivors, including emergency contacts at:

https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html