Western Science
Department of Chemistry

Introductory Analytical Chemistry, Chemistry 2272F, Course Outline

1. Course Information

This course emphasizes the quantitative aspects of chemistry. Starting with classical measurements of volumes and masses, the course will develop statistical tools of estimation, confidence, accuracy, and precision in treating experimental data. This includes an introduction to instrumental methods of analysis.

In the fall term of 2024, [redacted]
(you are registered in one of the 3 lab sessions and come only in that time slot).

List of Prerequisites

Prerequisite(s): (Chemistry 1301A/B and Chemistry 1302A/B), or (Chemistry 1301A/B and Integrated Science 1001X). Unless you have either the requisites for this course or written special permission from your Dean's Designate (Department/Program Counsellors and Science Academic Advisors) to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites. Please see http://www.registrar.uwo.ca for more details.

2. Instructor Information

Instructors	Email	Office	Phone	Drop-in hours
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]			

Your instructor's or lab coordinator's email should only be used for administrative purposes. In order to maximize efficiency and to allow your instructor to respond to administrative concerns as quickly as possible, emails of the following nature will *not* be responded to:

- Questions about course material or on how to do a particular problem on Achieve and/or the textbook. Such questions should be posted on the OWL forum or discussed during drop-in hours.
- Questions that can be answered based on the information found in this course outline. Being able to find information yourself is an important soft-skill and an employability outcome.
- Requests for grade increases, extra assignments, make-up labs, etc. (see related sections following).

When emailing your instructor, please use your Western email address and include *Chem 2272F* in the subject line. Messages from a non-Western account or those that do not include *Chem 2272F* may be blocked by the university's anti-spam system. It is also useful to include your student number somewhere in the message.

Constructive feedback is very valuable to us. Please do not hesitate to contact any one of the instructors if you have any comments or feedback on any aspect of Chem 2272F. We are always trying to improve the course so that we can improve your experience!

3. Course Syllabus, Schedule, Delivery Mode

Learning Outcomes: This course emphasizes the quantitative aspects of chemistry: classical measurements and instrumental methods of analysis. **Upon successful completion of this course, the student is expected to demonstrate the ability to:**

· Describe the basic principles and procedures to perform quantitative chemical analysis.

· Execute effective mathematical calculations necessary to achieve correct values in quantitative analysis.

· Conduct laboratory experiments of quantitative and instrument analysis with accuracy and precision.

· Compile professional level lab reports that are logically and concisely written with critical data analysis.

· Evaluate the accuracy of and sources of errors for a given quantitative or instrument analytical method.

· Work productively in the lab and complete the lab reports independently and on time.

Outline of Planned Lecture Topics

Section	Class Topic	Chapter in Harris
1	Administration, Introduction to Analytical Chemistry, Measurement Basics	0-2
2	Experimental Errors Statistics Quality Assurance Calibration Methods	3-5
3	Introduction to Titrations	7
4	Systematic Treatment of Equilibrium Acid-Base Equilibria Complexation Equilibria Acid-Base Titrations EDTA Titrations	8-12
5	Fundamentals of Electrochemistry Electrodes and Potentiometry Redox Titrations Electroanalytical Techniques	14-17
6	Fundamentals of Spectrophotometry Spectrophotometers Atomic Spectroscopy	18, 20, 21

In all of the topics, the primary focus is on the *understanding* of the concepts. Please try to garner a thorough, in-depth understanding of the material, because that is what allows success in chemistry. Accordingly tests and exams will be designed to evaluate your comprehension of the material and your ability to apply it to new and different scenarios, and not simply your ability to regurgitate memorized facts or substitute numbers into formulas.

CHEM 2272F LABORATORY SCHEDULE

There are 7 experiments in total. For more information, please read the 2024 lab manual.

Week of	Experiment
Sept. 9	Introduction to the Analytical Lab (in lab) Exp. 1: Data Analysis with Excel (online)
Sept. 16	Exp. 2: Titration of an ASA/SA Mixture
Sept. 23	Exp. 3: pH Titration of ASA
Sept. 30	Rotation Week 1 (Exp. 4-6): see posted schedule for details
Oct. 7	Rotation Week 2 (Exp. 4-6): see posted schedule for details
Oct. 14	No Labs - Fall Break
Oct. 21	Rotation Week 3 (Exp. 4-6): see posted schedule for details
Oct. 28	Water Project, Week 1
Nov. 4	Water Project, Week 2
Nov. 11	Water Project, Week 3
Nov. 18	Water Project, Week 4
Nov. 25	Water Project, Week 5
Classes End December 6	

Lab Evaluation: Experiments 1-6 are weighted equally and are worth a total 20% of your final course grade. The water project is worth 15% of your final course grade. This totals to the 35% of the lab component in the course.

Statement on the Use of Generative Artificial Intelligence (AI): As this course aims at building and strengthening your individual laboratory report writing, the use of generative artificial intelligence (AI) tools/software/apps is unacceptable in this course.

All labs will be in ChB Room 094 (lower ground level in Chemistry Building).

Students who arrive unprepared or late for a lab will receive a zero for that lab. No credit will be given for the prelab exercises. Students are deemed late if they arrive after the lab doors have closed. Lab technicians and teaching assistants have the right to eject students from the lab.

Due to limited resources, students are asked to work in pairs or groups of three in the lab. However, each student is expected to learn all aspects of the experiments. Likewise, each student is expected to contribute equally with their highest level of skills and effort. In the event of unequal contributions, the TAs will require the students to work individually for the remaining of the lab.

Safety and Dress Code

Western is committed to workplace health and safety, and has strict safety regulations. Even your instructor has to follow them! Lab TAs and technical staff will remove students who, in their opinion, do not meet the safety requirements or are not prepared, as described below. **These students, and those who arrive late, will receive a zero for the entire experiment, and no credit will be given for the prelab exercise.**

Eye Protection

Safety glasses or goggles must be worn by everyone whenever laboratory work, including the getting, cleaning, and returning of glassware, is being performed. Students who wear prescription glasses must wear appropriate safety glasses or goggles over their regular glasses. If you wear contact lenses, you must inform the lab TA that you are wearing contact lenses.

Lab Coat, Pants, Socks, and Footwear

The Occupational Health & Safety Office at Western mandates "shoulder-to-toe" coverage. A detailed description of the dress code is available in the Lab Manual. For hygienic reasons, we do not rent shoes, socks, pants, or lab coats.

Lab coats must be worn, buttoned up. Students must have a lab coat to enter the laboratory. They may not leave after the video or the prelab talk to get a lab coat or have one delivered.

Students must wear ankle-length pants, socks that cover the ankle, and shoes that cover the whole foot (top, sides, and back) without any "cutout holes." Shorts, sandals, and capris are among the items of clothing that are not acceptable. No skin may show at the ankles even when you are seated.

Dates to Note

Date	Event
Friday, September 6	Class begins
Thursday, September 13	Last day to make registration changes, such as lecture and lab sections. This is the last day to de-register from the course and remove it from your academic record.
Week of September 9	First week of laboratory rotations
Monday, September 30	National Day of Truth and Reconciliation (non-instructional day)
Monday, October 14	Thanksgiving holiday

Week of October 14	Fall Reading Week
Thursday, October 24, 6:30 pm	Midterm Test (topic cut-off and room details TBA)
Thursday, October 24, 6:30 pm	First Achieve Adaptive Quiz due
Tuesday, November 12	Last day to drop the course without academic penalty. If you drop the course on or before this date, it will remain on your academic record along with a WDN (withdrawn). If you drop the course after this date, it will result in an automatic F.
Friday, December 6	Last day of Chem 2272F lecture- All Achieve Adaptive Quizzes due

4. Course Materials

· **Chemistry 2272F Course Textbook is required:** *Quantitative Chemical Analysis*, 10th Ed., **Daniel C. Harris** and **Charles A. Lucy**

The ebook, Achieve, lab manual, and lab notebook are available at the Western bookstore at the following link:

https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2024A&courses%5B0%5D=001_UW/CHE2272F

· **Achieve Course Access Info:**

- **Course URL**: https://achieve.macmillanlearning.com/courses/paad7o
- **Achieve Course ID**: paad7o

· **Chemistry 2272F computer software:** *Microsoft Excel for data analysis*

· **Chemistry 2272F Laboratory Manual (2024 edition) is required**

Old editions may not be used. Students must bring this year's edition to every experiment.

· **Lab Coat**

For your protection, a proper lab coat is required. Designer lab coats, which are often sold as hospital scrubs or consultation coats, are not acceptable, because they are too short or do not offer sufficient protection to the upper body.

· **Safety Glasses**

Safety glasses may also be purchased through the ChemClub. If you wear glasses, it is important that the safety glasses fit over them properly. The safety glasses should sit close to your forehead.

· **Use of electronic devices**: Only basic scientific calculators are permitted on all tests and exams. All other electronic devices (cell phones, laptops, tablets, cameras, etc.) are prohibited. Students found in possession of prohibited devices will receive a mark of ZERO for the entire test or exam.

Students are responsible for checking the course Brightspace site (https://westernu.brightspace.com) on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class and where all course material will be posted.

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.

Achieve Student Checklist - this is a 'go-to HUB' for students:

- Contains information for students including registering for your course, how to use Achieve, FAQs, tech support etc.

Tech Support Options:

- **Via Online Form -** available 24/7
  - https://macmillan.force.com/macmillanlearning/s/contactsupport
- **Via Chat -** within the knowledge base
- **Via phone -** 800.936.6899 (times in EST): available Monday-Thursday 8:00am to 3:00am; Friday 8:00am to 12:00am, Saturday 12:00pm to 8:00pm, Sunday 12:00pm to 3:00am.

5. Methods of Evaluation

Tests and exams are necessary to assess your mastery of core concepts. Your overall course grade, out of 100, will be calculated as follows (alternative grading in brackets):

Component	Notes	%
Laboratory	20% Exp 1-6, 15% water project	35
Achieve (participation)	Online Adaptive Quizzes	5 (0)
Midterm Test	Thursday, October 24, 6:30–8:30 pm	20
Final Exam	Scheduled by the Registrar, 3.00 hours	40 (45)

Achieve Online Adaptive Quizzes: Students have the choice of using this additional study tool to gain a participation grade (5% of their total grade), or to have their final exam grade weighted to 45%. Students must complete a minimum of 12 adaptive quizzes to receive the full 5% participation grade by the end of the course (Dec 6, 2024). **The first quiz (any one of them) must be completed no later than the day of the midterm exam.** This is to avoid last minute issues with using the external online system on the final deadline of Dec 6th. **Please email Dr. Gateman prior to the midterm date if you have concerns (financial, privacy, etc.) with using Achieve online quizzes.** Students that do not complete at least 12 adaptive quizzes will have their final exam grade weighted to 45%.

To obtain credit for the course, all three requirements below must be met:

1. Obtain a minimum of 50% on the overall course grade, as calculated above.
2. Obtain a minimum of 50% on the laboratory component. This mark is calculated from all experiments. A missed experiment is assigned a mark of zero unless it has been “excused” (see section on Missed Course Components).
3. Miss no more than two experiments, whether excused or not.

Students who fail to meet requirement #2 or #3 will receive a course grade no greater than 40% (even if the calculated course grade is higher) and will not receive credit for the course.

6. Missed Course Components

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:

- Examinations scheduled during official examination periods

When a student *mistakenly* submits their one allowed Academic Consideration request **without supporting documentation**, the request cannot be recalled and reapplied. This privilege is forfeited.

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Missed Labs

There are no make-ups for in-person labs, and it is not possible to reschedule them. Students who miss a lab session (defined as a standalone lab experiment/introduction or one experimental session of the water project) do not need to apply for academic consideration, and the weight of the missed work will be shifted to other sessions. However, at least 8 lab sessions must be attended in total. Students who fail to meet this requirement will have to apply for a grade of incomplete (INC) at the Dean's Office and complete the missed lab work the next time the course is offered. Students who complete fewer than 8 lab sessions and do not have an INC will receive a course grade of not greater than 40%, even if the calculated grade is higher. Tests and exams will contain questions related to the theoretical aspects of the experiments. You are responsible for the material pertaining to the missed labs.

Late lab report submissions: The policy on late lab report submissions is detailed in the Laboratory Manual.

Missed Achieve Adaptive Quizzes

There are a total of 18 adaptive quizzes assigned throughout the course. To receive the participation mark of 5% (if chosen), students must complete a minimum of 12 quizzes. Academic considerations are built into this evaluation component, as students may decide if/when to miss a quiz. There will be no academic considerations for students that do not complete a minimum of 12 quizzes, but their final exam grade will simply be weighted to 45%.

Missed Midterm Exam

If you are unable to write the midterm test and are granted academic consideration, the weight of the midterm test will be shifted to the Final Exam. If you are not excused, you will receive a mark of ZERO.

Missed Final Exam

When you miss the Final Exam and their Academic Consideration has been granted, you will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

All requests for academic consideration must go through your faculty's Academic Counselling Office, so please contact them and *not your instructor*.

6. Additional Statements

Religious Accommodation

When conflicts 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 or 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.

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.

Academic Policies

The website for Registrar Services is https://www.registrar.uwo.ca/.
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 e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

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

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Support Services
Please visit the Science & Basic Medical Sciences Academic Advising webpage for information on adding/dropping courses, academic considerations for absences, appeals, 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 and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (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. You may also wish to contact Accessible Education at

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

if you have any questions regarding accommodations.

This course is supported by the Science Student Donation Fund. If you are a student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Advising site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the Chair of the Department or email the Science Students' Council at ssc@uwo.ca.

Chemistry on Social Media

Find the Department of Chemistry at Western on Facebook and Twitter!

- Facebook: @ChemistryatWestern
- Twitter: @westernuchem