



UNSW Course Outline

CHEM2041 Analytical Chemistry: Essential Methods - 2024

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General Course Information

Course Code : CHEM2041

Year : 2024

Term : Term 3

Teaching Period : T3

Is a multi-term course? : No

Faculty : Faculty of Science

Academic Unit : School of Chemistry

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

This course teaches the essential methods in analytical chemistry applicable to chemists, biologists, and most other disciplines of science. The course covers methods for treating analytical data including: estimation of uncertainties, chromatography and other separation

techniques, the applications of spectroscopy (UV/Visible absorption, infrared, fluorescence, NMR and mass spectrometry) to analysis and electrochemistry (including pH measurements). These analytical techniques will be applied to solving chemical structure problems and interesting applications of these techniques will be covered (e.g., gene and protein sequencing and metal speciation in environmental samples). The course involves lectures, labs and tutorials.

Course Aims

The aim of this course is to introduce students to the physical and chemical basis of analytical techniques, which is key foundational knowledge for many types of practicing scientists and engineers in industry, academia and government. The course will enable students to evaluate why certain methods of analysis might be better suited than others for a given situation.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Explain the analytical and chemical principles underlying common analytical methods such as chromatography and mass spectrometry, electroanalytical analysis and infra-red and NMR spectroscopies and to be able to analyse data from these tools in order to solve analytical problems.
CL02 : Solve unknown chemical structures using data from mass spectrometry, NMR, IR spectroscopy, UV-Vis and pH measurements.
CL03 : Apply statistical theory to establish the uncertainty associated with analytical measurements.
CL04 : Perform laboratory experiments following correct safety procedures.
CL05 : Present scientific information and experimental results using a structure and style suitable for formal scientific documentation, both individually and in consultation with lab members.

Course Learning Outcomes	Assessment Item
CL01 : Explain the analytical and chemical principles underlying common analytical methods such as chromatography and mass spectrometry, electroanalytical analysis and infra-red and NMR spectroscopies and to be able to analyse data from these tools in order to solve analytical problems.	<ul style="list-style-type: none"> • Laboratory • Final Exam • Structural Assignment
CL02 : Solve unknown chemical structures using data from mass spectrometry, NMR, IR spectroscopy, UV-Vis and pH measurements.	<ul style="list-style-type: none"> • Laboratory • Final Exam • Structural Assignment
CL03 : Apply statistical theory to establish the uncertainty associated with analytical measurements.	<ul style="list-style-type: none"> • Mid-Term Test • Laboratory • Final Exam
CL04 : Perform laboratory experiments following correct safety procedures.	<ul style="list-style-type: none"> • Laboratory
CL05 : Present scientific information and experimental results using a structure and style suitable for formal scientific documentation, both individually and in consultation with lab members.	<ul style="list-style-type: none"> • Laboratory

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Laboratory Assessment Format: Individual	35%	
Mid-Term Test Assessment Format: Individual	10%	Due Date: Week 4: 30 September - 06 October
Final Exam Assessment Format: Individual	40%	
Structural Assignment Assessment Format: Individual	15%	Due Date: Week 5: 07 October - 13 October

Assessment Details

Laboratory

Assessment Overview

Core Skills (10%):

The laboratory core skills are assessed each week by demonstrating your individual skills to your lab demonstrators. You will perform the relevant experiments and analysis for the assessments during each core skills laboratory session. Feedback will be provided through comments and discussion with your lab demonstrator.

Results Proformas and Report (25%):

The laboratory results are assessed each week based on the completion of results assignments for the problem solving labs and the formal lab report. The results assignments are worth 20% in total and the report is worth 10% of your final mark. The results assignments are based on the accuracy of the analysis and reporting of lab results in addition to short answer questions and multiple choice questions involving a mix of both individual assignments and group work. Lab results for one of the experiments will be written up individually in the format of a formal report. Feedback will be provided through comments and discussion with your lab demonstrator.

Hurdle: You must attend a minimum of 8/10 laboratory classes to meet the pass level requirement for the course.

Course Learning Outcomes

- CL01 : Explain the analytical and chemical principles underlying common analytical methods such as chromatography and mass spectrometry, electroanalytical analysis and infra-red and NMR spectroscopies and to be able to analyse data from these tools in order to solve analytical problems.

- CL02 : Solve unknown chemical structures using data from mass spectrometry, NMR, IR spectroscopy, UV-Vis and pH measurements.
- CL03 : Apply statistical theory to establish the uncertainty associated with analytical measurements.
- CL04 : Perform laboratory experiments following correct safety procedures.
- CL05 : Present scientific information and experimental results using a structure and style suitable for formal scientific documentation, both individually and in consultation with lab members.

Hurdle rules

You must attend a minimum of 7/9 laboratory classes to meet the pass level requirement for the course.

Generative AI Permission Level

Simple Editing Assistance

In completing this assessment, you are permitted to use standard editing and referencing functions in the software you use to complete your assessment. These functions are described below. You must not use any functions that generate or paraphrase passages of text or other media, whether based on your own work or not.

If your Convenor has concerns that your submission contains passages of AI-generated text or media, you may be asked to account for your work. If you are unable to satisfactorily demonstrate your understanding of your submission you may be referred to UNSW Conduct & Integrity Office for investigation for academic misconduct and possible penalties.

For more information on Generative AI and permitted use please see [here](#).

Mid-Term Test

Assessment Overview

The Mid-term Test is designed to summarise your learning and problem solving skills on the Statistics Modules. The test is typically 45 min and consists of multiple choice, short numerical and short answer responses. Practice quizzes reflective of the types of questions that will be asked are provided within the stats modules in preparation for the mid-term assessment. Feedback will be provided within two weeks of the test.

Course Learning Outcomes

- CL03 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

Final Exam

Assessment Overview

The final exam is designed to summarize your learning and problem-solving skills on all topics delivered across all weeks of the term; particularly the material from the lectures and tutorials. The exam is typically one hour and consists of multiple choice questions, short numerical and short answer responses - details including a practice exam will be confirmed during the course. The examination will occur during the official university examination period. Feedback is available through inquiry with the course convenor.

Course Learning Outcomes

- CL01 : Explain the analytical and chemical principles underlying common analytical methods such as chromatography and mass spectrometry, electroanalytical analysis and infra-red and NMR spectroscopies and to be able to analyse data from these tools in order to solve analytical problems.
- CL02 : Solve unknown chemical structures using data from mass spectrometry, NMR, IR spectroscopy, UV-Vis and pH measurements.
- CL03 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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Structural Assignment

Assessment Overview

An assignment based on the spectroscopy and structure determination lectures involving short answers and multiple-choice questions. You will have two weeks to complete the assignment. For feedback, you will receive comments. More detailed feedback is available upon request from the lecturer.

Course Learning Outcomes

- CL01 : Explain the analytical and chemical principles underlying common analytical methods such as chromatography and mass spectrometry, electroanalytical analysis and infra-red and NMR spectroscopies and to be able to analyse data from these tools in order to solve analytical problems.
- CL02 : Solve unknown chemical structures using data from mass spectrometry, NMR, IR spectroscopy, UV-Vis and pH measurements.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

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General Assessment Information

General assessment information will be covered in information provided in Week 1 and via Moodle.

Grading Basis

Standard

Requirements to pass course

To be awarded a pass in this subject, students must satisfy three conditions:

- (i) An overall pass ($\geq 50\%$) in the laboratory component, and
- (ii) Satisfactory overall performance ($\geq 35\%$ out of 100%) in all examinations - ie. from the weighted combined mark for the Statistics Data Analysis exam and the Final exam.
- (iii) A minimum attendance of 7 out of 9 lab sessions across Weeks 1-10 (including both the Analysis and Experiment components) is required.

Failure to satisfy all criteria could result in either a FL or UF (Unsatisfactory Fail) grade being awarded, or further assessment being offered at the sole discretion of the course coordinator. Students must ensure their availability to attend any supplementary examination that will usually be offered in the week suggested by UNSW; inability or failure to attend a supplementary examination may lead to a FL or UF (Unsatisfactory Fail) grade being confirmed.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 9 September - 15 September	Lecture	Spectroscopy lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am Course Introduction [In-Person]
	Laboratory	Tuesday; Laboratory introduction and Statistics Module. [In-Person] See roster for details of laboratory components on the course Moodle page.
Week 2 : 16 September - 22 September	Lecture	Spectroscopy lectures [on-demand online streaming]
	Workshop	Monday 10am -11am Workshop - Spectroscopy [In-Person]
	Laboratory	Tuesday; Spectroscopy Laboratory and Statistics Module. [In-Person] See roster for details of laboratory components on the course Moodle page.
Week 3 : 23 September - 29 September	Lecture	Spectroscopy lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am Workshop - Spectroscopy [In-Person]
	Laboratory	Tuesday; Spectroscopy Laboratory and Statistics Module. [In-Person] See roster for details of laboratory components on the course Moodle page.
Week 4 : 30 September - 6 October	Lecture	Spectroscopy/Electrochemistry lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am Electrochemistry Workshop - [In-person]
	Laboratory	Tuesday; Spectroscopy Laboratory and Electrochemistry Laboratory. [In-Person] See roster for details of laboratory components on the course Moodle page.
	Assessment	Mid-term Exam on Statistics Modules Statistics exam; 9 am on Thursday the 3rd of October, Rex Vowels Theatre (K-F17-LG3) (bring your own device)
Week 5 : 7 October - 13 October	Lecture	Electrochemistry lectures [on-demand online streaming]
	Other	Monday 7th of October - Public Holiday, no workshop.
	Laboratory	Tuesday; Spectroscopy Laboratory and Electrochemistry Laboratory. [In-Person] See roster for details of laboratory components on the course Moodle page.
	Assessment	Structural determination assessment Structural determination assessment; due online, Friday the 11th of October at 11.59pm. Refer to Moodle and your lecturer for details.
Week 6 : 14 October - 20 October	Other	Flexibility week - no classes
Week 7 : 21 October - 27 October	Lecture	Electrochemistry/Chromatography lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am, Electrochemistry Workshop [In-Person]
	Laboratory	Tuesday; Spectroscopy Laboratory and Electrochemistry Laboratory. [In-Person] See roster for details of laboratory components on the course Moodle page.
Week 8 : 28 October - 3 November	Lecture	Chromatography and Mass spectrometry lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am, Chromatography and Mass Spectrometry Workshop [In-Person]
	Laboratory	Tuesday; Spectroscopy Laboratory and Electrochemistry Laboratory. [In-Person] See roster for details of laboratory components on the course Moodle page.
	Assessment	Formal lab report is due in week 8 or 9 for Fluoride Experiment - due Monday 11.59pm the week after completing the laboratory (refer to lab roster)
Week 9 : 4 November - 10 November	Lecture	Chromatography and Mass spectrometry lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am, Chromatography and Mass Spectrometry Workshop [In-Person]
	Laboratory	Tuesday; Chromatography and Mass Spectrometry Laboratories [In-Person] See roster for details of laboratory components on the course Moodle page.
	Assessment	Formal lab report is due in week 8 or 9 for Fluoride Experiment - due Monday 11.59pm the week after completing the laboratory (refer to lab roster)
Week 10 : 11 November - 17 November	Lecture	Chromatography and Mass spectrometry lectures [on-demand online streaming]
	Workshop	Monday 10am - 11am, Chromatography and Mass Spectrometry Workshop

		[In-Person]
	Laboratory	Tuesday; Chromatography and Mass Spectrometry Laboratories [In-Person] See roster for details of laboratory components on the course Moodle page.

Attendance Requirements

Attendance at laboratory classes is compulsory and any absences must be satisfactorily justified by lodging a special consideration request. Students arriving more than 10 minutes after the class start time are too late to commence and will be deemed to have been absent from that laboratory session. This is strict both due to both safety briefing and because being late is unfair to the other students who will want to complete their work on time. **A laboratory attendance rate of less than 7 out of 9 labs across Weeks 1-10 will result in automatic failure of the course.** Those with medical certification for a laboratory absence should contact the course coordinator at the first opportunity and lodge a special consideration request.

General Schedule Information

In this course, we utilise online lectures and associated content, and face-to-face workshops and laboratory-based teaching methods. It is important to keep up to date on viewing the lecture content, as the workshops are in coordination with lectures, and the lecture content will assist with the labs.

Course Resources

Prescribed Resources

Fundamentals of Analytical Chemistry, 8th edition D. A. Skoog, D. M. West, F. J. Holler and S. R. Crouch, Thomson Brooks/Cole, (2004).

OR

Fundamentals of Analytical Chemistry, 9th edition D. A. Skoog, D. M. West, F. J. Holler and S. R. Crouch, Thomson Brooks/Cole, (2013).

Recommended Resources

Data Analysis for Chemistry: An Introductory Guide for Students and Laboratory Scientists, D. Brynn Hibbert and J. J. Gooding, Oxford University Press, New York, (2006).

Organic Structures from Spectra, 6th Edition, L D Field, H L Li and A M Magill, John Wiley and

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Nicole Rijs				By appointment	Yes	Yes
Lecturer	John Stride					No	No
	Justin Gooding					No	No
	Karin Schaffarczyk McHale					No	No

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](#).

Academic Honesty and Plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Further information about referencing styles can be located at <https://student.unsw.edu.au/referencing>

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits: honesty, trust, fairness, respect,

responsibility and courage. At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

Further information about academic integrity, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](#),
- The [ELISE training site](#), and
- The [Use of AI for assessments](#) site.

The Student Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: <https://student.unsw.edu.au/conduct>

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: <https://student.unsw.edu.au/special-consideration>

Important note: UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)

School-specific Information

UNSW Changes to Special Consideration: Short Extension

The School of Chemistry has carefully reviewed all of its assessments to determine whether they are suitable for automatic short extensions as set out by the UNSW Short Extension Policy. The current deadline structures for all assessment tasks in the School of Chemistry already accommodate the possibility of unexpected circumstances that may lead students to require additional time for submission. **The School of Chemistry has opted out of the UNSW Short Extension provision for all its courses**, and we have already integrated flexibility into our assessment deadlines. This decision is subject to revision in response to the introduction of new course offerings. All students may still apply for Special Consideration for any assessment via the usual procedures.

School Contact Information

Level 1, Dalton Building (F12)

W: www.chemistry.unsw.edu.au

Also see: ***Contacts and Support*** section of the course Moodle page (where applicable)