UNSW Course Outline

CHEM2051 Analytical Chemistry for the Pharmaceutical Sciences - 2024

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General Course Information

Course Code : CHEM2051
Year : 2024
Term : Term 1
Teaching Period : T1
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 that are applicable to the pharmaceutical sciences. The course covers data analysis methods including estimation of uncertainties; chromatography and other separation techniques; and the applications of

spectroscopy (UV/Visible absorption, infrared, fluorescence, microscopy, NMR and mass spectrometry) to analysis. These analytical techniques will be applied to solving chemical structure problems, and other relevant applications of these techniques will also be covered (e.g. protein sequencing; rapid antigen tests; identification of drug metabolites).

Course Aims

This course aims to provide you with an up-to-date perspective on some modern methods in the pharmaceutical industry, including the physical and chemical basis of the analytical techniques that underpin drug metabolite identification and rapid antigen tests.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Describe the analytical and chemical principles underlying chromatography, mass spectrometry, molecular electronic spectroscopy, infrared spectroscopy and NMR spectroscopy.
CLO2 : Solve unknown chemical structures using data from the techniques covered in the course.
CLO3 : Describe key applications of the various analytical techniques covered by the course.
CLO4 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

Course Learning Outcomes	Assessment Item
CLO1 : Describe the analytical and chemical principles underlying chromatography, mass spectrometry, molecular electronic spectroscopy, infrared spectroscopy and NMR spectroscopy.	• Final exam
CLO2 : Solve unknown chemical structures using data from the techniques covered in the course.	• Spectroscopy assignment • Laboratory assessment • Final exam
CLO3 : Describe key applications of the various analytical techniques covered by the course.	• Final exam
CLO4 : Apply statistical theory to establish the uncertainty associated with analytical measurements.	• Statistics Data Analysis Test • Laboratory assessment • Final exam

Learning and Teaching Technologies

Moodle - Learning Management System

Learning and Teaching in this course

In this course, we utilise online lectures and associated content, and face-to-face tutorials and laboratory-based teaching methods. The lectures and tutorials will be delivered in an engaging interactive style with questions and activities blended with content delivery. The online material is a mixture of long and short video-lectures, web-based calculators and mini-programs which are then assessed through online activities / calculations.

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Statistics Data Analysis Test Assessment Format: Individual	10%	
Final exam Assessment Format: Individual	40%	Due Date: Exam period
Spectroscopy assignment Assessment Format: Individual	5%	
Laboratory assessment Assessment Format: Individual	45%	

Assessment Details

Statistics Data Analysis Test

Assessment Overview

This exam takes the form of a timed Moodle assignment, which you will complete on your own computer under self-imposed exam conditions. The exam will take place during Week 7 (precise time to be announced on Moodle closer to the time). The exam duration is 40 minutes. The format of the exam will be very similar to the statistics quizzes that you will complete as part of your laboratory work in the lead-up to the exam. In addition to Moodle you can use Excel, a calculator, and your own lecture notes. You are not permitted to communicate with anyone else during the exam. Your mark will be returned to you within 2 weeks, via Moodle. Individual feedback will be available upon request.

Course Learning Outcomes

- CLO4 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

Final exam

Assessment Overview

The final exam will take the form of a timed Moodle assignment, which you will complete on your own computer under self-imposed exam conditions. The exam duration is 70 minutes (notionally 10 min reading time + 60 min writing time). The exam will cover the entirety of the course content. The exam will consist of 3 sections: (i) Spectroscopic methods (25 marks); (ii) Personalised medicine (15 marks); (iii) chromatography and mass spectrometry (20 marks). All sections will contain a mixture of multi-choice and short-answer questions. The exam is open-book, but you must not communicate with anyone else during the exam. You will not learn your exam mark directly; instead, your overall course mark will be provided on the official release of results day. Individual feedback on your exam performance will be available upon request from the course coordinator.

Course Learning Outcomes

- CLO1 : Describe the analytical and chemical principles underlying chromatography, mass spectrometry, molecular electronic spectroscopy, infrared spectroscopy and NMR spectroscopy.
- CLO2 : Solve unknown chemical structures using data from the techniques covered in the course.
- CLO3 : Describe key applications of the various analytical techniques covered by the course.
- CLO4 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

Detailed Assessment Description

1hr Online examination of all the course content.

Spectroscopy assignment

Assessment Overview

This is a Moodle assignment which you will have approximately 2 weeks to complete. The due date will be in Week 5 (precise deadline to be announced via Moodle closer to the time). The assignment consists of a series of ~8 multi-choice questions that will require you to match spectroscopic data (e.g. NMR) with candidate molecules. The questions are not equally weighted. You are encouraged to study with peers, but the assignment must be your own work. You will receive your mark via Moodle within 2 weeks. Individual feedback will be available from your lecturer upon request.

Course Learning Outcomes

- CLO2 : Solve unknown chemical structures using data from the techniques covered in the

course.

Laboratory assessment

Assessment Overview

The laboratory component of the course is assessed continuously throughout the term. The overall laboratory mark comprises the following:

- Core lab skills = 15%. This mark is awarded on an all-or-nothing basis. You will receive multiple opportunities and plenty of help to meet the required standard; full details are on Moodle.
- Data collection & analysis, calculations, critical thinking questions = 20%. This mark is 4% for each of 5 laboratory exercises, based on your calculations of unknown concentrations of an analyte, or on your solving of the structure of an unknown compound.
- Final lab report = 10%. This mark is awarded on a sliding scale, based on the quality of your writing of 4 key sections, i.e. Introduction, Experimental, Results, Discussion. Detailed instructions are on Moodle.

Course Learning Outcomes

- CLO2 : Solve unknown chemical structures using data from the techniques covered in the course.
- CLO4 : Apply statistical theory to establish the uncertainty associated with analytical measurements.

General Assessment Information

Grading Basis

Standard

Requirements to pass course

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

(i) An overall pass (≥ 50%) in the laboratory component, and

(ii) Satisfactory overall performance (≥ 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 : 12 February - 18 February	Lecture	Spectroscopy
	Laboratory	
Week 2 : 19 February - 25 February	Lecture	Spectroscopy
	Laboratory	
Week 3 : 26 February - 3 March	Lecture	Spectroscopy
	Laboratory	
Week 4 : 4 March - 10 March	Lecture	Personalised medicine (e.g. lateral flow devices)
	Laboratory	
Week 5 : 11 March - 17 March	Lecture	Personalised medicine (e.g. lateral flow devices)
	Laboratory	
Week 6 : 18 March - 24 March	Other	Flexibility week - no classes
Week 7 : 25 March - 31 March	Lecture	Chromatography and Mass Spectrometry
	Laboratory	
Week 8 : 1 April - 7 April	Lecture	Chromatography and Mass Spectrometry
	Laboratory	
Week 9 : 8 April - 14 April	Lecture	Chromatography and Mass Spectrometry
	Laboratory	
Week 10 : 15 April - 21 April	Lecture	Chromatography and Mass Spectrometry
	Laboratory	

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

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 Sons, Chichester, West Sussex, UK; (2020) ISBN: 978-1-1195-2480-9.

Others will be advised by individual lecturers.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Luke Hunter		Dalton 221		By appointment	Yes	Yes

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 Plagarism

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)