UNSW Course Outline

CHEM2832 Medicines: Small Molecules to Macromolecules - 2024

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General Course Information

Course Code : CHEM2832
Year : 2024
Term : Term 2
Teaching Period : T2
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 will provide you with an understanding of what medicinal chemistry is, and how it is

carried out. It will describe the interdisciplinary process of how new medicines are designed and developed.

The first major section of the course contains a refresher of some fundamental concepts in organic chemistry (e.g. structure and bonding; functional groups; intermolecular forces) and an introduction to different classes of drug targets (e.g. DNA; RNA; proteins; carbohydrates).

The second major section of the course focuses on small-molecule drug development. The various sources of lead compounds are examined, including examples from Australian traditional medicine. The concepts of pharmacodynamics and pharmacokinetics are investigated. Several valuable computational tools for drug development are introduced (e.g. docking, logP prediction). Strategies for lead optimisation are examined (e.g. isosteric replacements; metabolic fixes; rigidification; simplification; extension).

The third major section of the courses focuses on biologics and other macromolecular drugs. Several classes of biological macromolecules are examined in detail, including their structure and function; methods for their industrial production; and examples of their therapeutic use. A strong emphasis will be given to the science of mRNA vaccines. Non-natural macromolecules / nanoparticles will also be examined, including their use either as therapeutics in their own right or as delivery agents for other drugs (e.g. liposomes for mRNA vaccines).

Throughout the course, a strong emphasis will be placed on peer learning through a series of student-led workshops.

Course Aims

The course aims to provide you with a broad appreciation of what medicinal chemistry is, how it is used in the discovery and design of drugs, and the underlying fundamental science on which it is based. On completing this course you will understand the connections between chemistry, biology, pharmacology and medicine.

Course Learning Outcomes

Course Learning Outcomes
CLO1 : Predict or analyse the binding of small molecules to their biomacromolecular targets, drawing upon a knowledge of fundamental organic chemistry concepts
CLO2 : Analyse the processes by which new small-molecule drugs are discovered and developed
CLO3 : Describe the different types of macromolecular structures (e.g. proteins, mRNA, synthetic polymers) that can be used as therapeutics in their own right, or as delivery agents for other therapeutics
CLO4 : Demonstrate the transferable skills of teamwork, oral scientific communication, and written scientific communication

Course Learning Outcomes	Assessment Item
CLO1 : Predict or analyse the binding of small molecules to their biomacromolecular targets, drawing upon a knowledge of fundamental organic chemistry concepts	• Workshop assessment • In-term test #1
CLO2 : Analyse the processes by which new small-molecule drugs are discovered and developed	• In-term test #2 • Workshop assessment
CLO3 : Describe the different types of macromolecular structures (e.g. proteins, mRNA, synthetic polymers) that can be used as therapeutics in their own right, or as delivery agents for other therapeutics	• In-term test #3 • Workshop assessment
CLO4 : Demonstrate the transferable skills of teamwork, oral scientific communication, and written scientific communication	• Workshop assessment

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
In-term test #2 Assessment Format: Individual	20%	
In-term test #3 Assessment Format: Individual	20%	
Workshop assessment Assessment Format: Group	40%	
In-term test #1 Assessment Format: Individual	20%	

Assessment Details

In-term test #2

Assessment Overview

This test covers material from the second lecture block (“Small-molecule drug development”).The test will be conducted in person, with pen-on-paper, under exam conditions, during your timetabled EXAM class in week 8.The test duration will be 45 minutes. The test will contain a mixture of multi-choice and short-answer questions; the latter may require you to draw some chemical structures. You will learn your test mark within 2 weeks, via Moodle. Individual feedback will be available from the lecturer upon request.

Course Learning Outcomes

- CLO2 : Analyse the processes by which new small-molecule drugs are discovered and developed

In-term test #3

Assessment Overview

This test covers material from the third lecture block (“Macromolecular therapeutics”).The test will be conducted in person, with pen-on-paper, under exam conditions, during the Study Break/ Exam Period. The test duration will be 45 minutes. The test will contain a mixture of multi-choice and short-answer questions; the latter may require you to draw some chemical structures. You will learn your test mark within 2 weeks, via Moodle. Individual feedback will be available from the lecturer upon request.

Course Learning Outcomes

- CLO3 : Describe the different types of macromolecular structures (e.g. proteins, mRNA,

synthetic polymers) that can be used as therapeutics in their own right, or as delivery agents for other therapeutics

Workshop assessment

Assessment Overview

A range of group-based and individual assessment tasks will take place during the weekly Workshop classes, including:

- Submission of 2x written reports (weeks 5+10, 7.5% each). You will work in a pair with another student to produce each report. The topics will include the history of a particular drug, or of a macromolecular therapeutic agent. Each report should be approximately 2–3 pages in length, completed according to the template provided on Moodle. A sample report is also provided on Moodle, along with a sample marking rubric. Your mark, and feedback, will be returned to you within 1 week of the submission deadline. You and your partner will receive the same mark.
- Delivery of 2x oral presentations (weeks 5+10, 7.5% each). You will work in a pair with another student to deliver each presentation. The topics will align with the written reports. Your presentation should be of 5 minutes' duration, and should include 4 PowerPoint slides with no animations. A recording of a sample presentation is provided on Moodle, along with a sample marking rubric. Your mark, and feedback, will be returned to you within 1 week of the presentation. You will receive an individual mark.
- Critical evaluation of your own work and your peers' work (weeks 4+9, 5% each). Twice during the term, you will be invited to constructively critique other students' workshop assessments by completing a (mock) marking rubric, focusing on either a draft report or a rehearsal presentation. Your peers may use your feedback to improve their own work before it is marked by staff. You will also individually submit a piece of reflective writing, describing how evaluating others' work has informed your own practice. You will receive marks based on the insightfulness of your criticisms and reflections. You will learn your mark within 1 week of the submission deadline.
- Full details of the Workshop assessment are available on Moodle.

Course Learning Outcomes

- CLO1 : Predict or analyse the binding of small molecules to their biomacromolecular targets, drawing upon a knowledge of fundamental organic chemistry concepts
- CLO2 : Analyse the processes by which new small-molecule drugs are discovered and developed
- CLO3 : Describe the different types of macromolecular structures (e.g. proteins, mRNA, synthetic polymers) that can be used as therapeutics in their own right, or as delivery agents for other therapeutics
- CLO4 : Demonstrate the transferable skills of teamwork, oral scientific communication, and written scientific communication

In-term test #1

Assessment Overview

This test covers material from the first lecture block (“Organic chemistry refresher”).The test will be conducted in person, with pen-on-paper, under exam conditions, during your timetabled EXAM class in week 4.The test duration will be 45 minutes. The test will contain a mixture of multi-choice and short-answer questions; the latter may require you to draw some chemical structures. You will learn your test mark within 2 weeks, via Moodle. Individual feedback will be available from the lecturer upon request.

Course Learning Outcomes

- CLO1 : Predict or analyse the binding of small molecules to their biomacromolecular targets, drawing upon a knowledge of fundamental organic chemistry concepts

General Assessment Information

• Past and/or mock papers for the in-term tests are available on Moodle, along with associated marking rubrics.
• Marking rubrics for the oral and written workshop presentations are available on Moodle.

Grading Basis

Standard

Requirements to pass course

This course has several hurdle requirements. In order to pass, you must do ALL of the following:
• Achieve an overall course mark of at least 50/100;
• Score at least 21/60, aggregated across the 3 in-term tests;
• Complete all workshop assignments.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 27 May - 2 June	Lecture	Organic chemistry refresher (I): Structure and bonding
Week 2 : 3 June - 9 June	Lecture	Organic chemistry refresher (II): Functional groups and intermolecular forces
	Workshop	
Week 3 : 10 June - 16 June	Lecture	Organic chemistry refresher (III): Structures of biomacromolecular targets
	Workshop	
Week 4 : 17 June - 23 June	Lecture	Small-molecule drug development (I): Sources of lead compounds
	Workshop	
	Assessment	In-term test #1 (20%) It will take place during your timetabled EXAM class.
Week 5 : 24 June - 30 June	Lecture	Small-molecule drug development (II): Introductory pharmacodynamics and pharmacokinetics
	Workshop	
Week 6 : 1 July - 7 July	Other	No classes (flexibility week)
Week 7 : 8 July - 14 July	Lecture	Small-molecule drug development (III): Strategies for lead optimization; computational tools for drug development
	Workshop	
Week 8 : 15 July - 21 July	Lecture	Macromolecular therapeutics (I): Protein-based therapies
	Workshop	
	Assessment	In-term test #2 (20%) It will take place during your timetabled EXAM class.
Week 9 : 22 July - 28 July	Lecture	Macromolecular therapeutics (II): Nucleic acid-based therapies
	Workshop	
Week 10 : 29 July - 4 August	Lecture	Macromolecular therapeutics (III): Nanoparticles for drug delivery
	Workshop	

Attendance Requirements

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

Course Resources

Prescribed Resources

Textbook: “Molecules and Medicine” by Corey, Czako and Kurti.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Luke Hunter				By appointment	Yes	Yes
Lecturer	Albert Fahrenbach				By appointment	No	No
	Pall Thordarson				By appointment	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 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)