

CHEM2310: Organic Chemistry

Callaghan

Semester 1 - 2024



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA

OVERVIEW

Course Description This course deals with concepts in organic chemistry, the branch of chemistry that deals with compounds of carbon. The course covers the chemistry of functional groups, their chemical reactions and their spectroscopic identification and characterisation. The laboratory introduces the students to practical skills on the synthesis, separation, purification and identification of organic compounds employing exemplar reactions, methods and techniques. A good understanding of organic chemistry is important for students intending to become chemists and those involved in other STEMM disciplines. The spectroscopic (infrared, nuclear magnetic resonance) and mass spectrometric techniques for the characterisation of organic compounds are taught in the first 3 weeks of the semester.

Academic Progress Requirements Nil

Requisites Students must have successfully completed CHEM1020 to enrol in this course.

Students who have not completed CHEM1020 but who hold equivalent wet lab experience should contact the Course Coordinator for guidance. Students with a background that includes equivalent wet lab experience should contact the Course Coordinator for guidance.

Assumed Knowledge CHEM1010 Introductory Chemistry I
Contact Hours Callaghan

Laboratory *
Face to Face On Campus
3 hour(s) per week(s) for 9 week(s)

Lecture
Face to Face On Campus
26 hour(s) per term
3 hours per week for 2 weeks and 2 hours per week for 10 weeks

Tutorial
Face to Face On Campus
1 hour(s) per week(s) for 10 week(s)

Workshop
Face to Face On Campus
3 hour(s) per week(s) for 3 week(s)

Unit Weighting Workload

* This contact type has a compulsory requirement.
10
Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

COURSE OUTLINE

www.newcastle.edu.au
CRICOS Provider 00109J

CONTACTS

Course Coordinator **Callaghan**
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SYLLABUS

- Course Content**
1. Structure analysis and characterisation of compounds:
 - Infrared (IR) spectroscopy
 - Nuclear magnetic resonance (NMR) spectroscopy
 - Mass spectrometry
 2. The how and why of organic chemistry
 - Chemical reactivity and mechanism
 - Nucleophilic substitution at sp carbons
 - Elimination reactions
 - Addition to unsaturated systems
 - Nucleophilic reactions at carbonyls
 - Enolate chemistry
 - Aromaticity and electrophilic aromatic substitution
 3. Essential laboratory skills: literature survey, exemplar synthesis, identification, separation and purification of organic compounds

- Course Learning Outcomes**
- On successful completion of this course, students will be able to:**
1. Identify characteristic organic reactions and illustrate reaction mechanisms;
 2. Apply spectroscopic techniques in the identification of functional groups and elucidation of the structure of organic compounds;
 3. Independently integrate key organic chemistry concepts that apply to the identification, characterisation and reactions of functional groups;
 4. Acquire practical skills on the synthesis, separation, purification and identification of organic compounds employing exemplar reactions, methods and techniques;
 5. Work safely and competently in an organic chemistry lab setting;
 6. Record and present data and write reports in a format suitable for organic chemistry.

Course Materials

Lecture Materials:

- Lecture staff **may choose to** provide copies of their lectures slides and ancillary material. Should this be the case, this material will be available through the Canvas site.

Recommended Text:

- McMurray, Organic Chemistry, 9th Edition, free download <https://openstax.org/>
J. Clayden, N. Greeves, S. Warren, Organic Chemistry, Oxford University Press, 2 Edition

COMPULSORY REQUIREMENTS

In order to pass this course, each student must complete ALL of the following compulsory requirements:

Contact Hour Requirements:

- Laboratory Has compulsory attendance

Course Assessment Requirements:

- Assessment 1 - Formal exam: Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.
- Assessment 3 - Laboratory exercises and reports: Pass requirement - Must pass this assessment item to pass the course.
- Assessment 4 - Spectroscopy Assessment: Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	26 Feb	Lectures and Tutorial Spectroscopy / spectrometry (TF)	Lectures, tutorial and Laboratory: Experiment 1 - Separations	Revision Quiz (Formative) - Online Open until Week 5.
2	4 Mar	Lectures and Tutorial Spectroscopy / spectrometry (TF)	Lectures, tutorial and Laboratory: Experiment 1 - Separations	
3	11 Mar	Lectures and Tutorial: Nucleophilic substitution at sp ³ carbons (AM)	Lecture/Tutorial/Lectorial and Spectroscopy Workshop (NMR Processing) Stereochemistry (online module)	Experiment 1 Report
4	18 Mar	Lectures and Tutorial: Nucleophilic substitution at sp ³ carbons (AM)	Lecture/Tutorial/Lectorial and Spectroscopy Workshop (Structure Elucidation)	
5	25 Mar	Laboratory Workshop No Lectures or Tutorial – Good Friday	Lecture/Tutorial/Lectorial and Workshop (SciFinder and ChemDraw)	Revision Quiz closes.
6	1 Apr	Lectures and Tutorial: Eliminations (AM)	Lecture/Tutorial/Lectorial and Laboratory: Experiment 2 - Banana Oil (synthesis)	Spectroscopy assignment AM's Assessment (Wks 3-5) – Online Quiz
7	8 Apr	Lectures and Tutorial: Addition to Alkenes and alkynes (RC)	Lecture/Tutorial/Lectorial and Laboratory: Experiment 2 - Banana Oil (distillation and characterisation)	
Mid-Semester Recess				
Mid-Semester Recess				

8	29 Apr	Lectures and Tutorial Nucleophilic addition (RC)	Lecture/Tutorial/Lectorial and Laboratory: Experiment 3 - Reductive Amination (Synthesis and characterisation)	Experiment 2 Report.
9	6 May	Lectures and Tutorial Nucleophilic substitution (RC)	Lecture/Tutorial/Lectorial and Laboratory: – Experiment 4 Part 1 - Multistep Synthesis (Protect and Recrystallisation)	RC's Assessment (Wks 6-8) - Online Quiz
10	13 May	Lectures and Tutorial Enolate chemistry (TF)	Lecture/Tutorial/Lectorial and Lab – Expt 4 Part 2 - Multistep Synthesis (Bromination and Recrystallisation)	Experiment 3 Report
11	20 May	Lectures and Tutorial Aromaticity (TF)	Lecture/Tutorial/Lectorial and Laboratory: Experiment 4 Part 3 - Multistep Synthesis (Deprotect and Recrystallisation)	
12	27 May	Lectures and Tutorial Electrophilic aromatic substitution (TF)	Lecture/Tutorial/Lectorial and Laboratory: Experiment 4 clean up	TF's Assessment (Wks 9-12) - In-class Quiz Experiment 4 Report
13	3 Jun			
Examination Period				
Examination Period				

ASSESSMENTS

This course has 4 assessments. Each assessment is described in more detail in the sections below.

	Assessment Name	Due Date	Involvement	Weighting	Learning Outcomes
1	Formal exam*	Exam Period - as scheduled	Individual	45%	1, 3
2	Online quiz or in-class quiz or assignment	Week 5, Week 6, Week 9, Week 12	Individual	10%	1
3	Laboratory exercises and reports*	See lab schedule and lab manual for details.	Individual	30%	1, 2, 4, 5, 6
4	Spectroscopy Assessment*	Week 6.	Individual	15%	2

* This assessment has a compulsory requirement.

Late Submissions

The mark for an assessment item submitted after the designated time on the due date, without an approved extension of time, will be reduced by 10% of the possible maximum mark for that assessment item for each day or part day that the assessment item is late. Note: this applies equally to week and weekend days.

Assessment 1 - Formal exam

Assessment Type	Formal Examination
Purpose	The final formal examination is designed to test the individual student's knowledge of the course materials and their ability to integrate key concepts from these materials.
Description	The examination is divided into 3 sections: 33.33% for Section A (Weeks 3 to 5), 33.33% for Section B (Weeks 6 to 8) and 33.33% for Section C (Weeks 9 to 12). Refer to the schedule for the coverage but note that concepts covered by different lecturers and sections could be integrated into one assessment item.
Weighting	45%
Compulsory Requirements	Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.
Length	2 hours
Due Date	Exam Period - as scheduled
Submission Method	Formal Exam
Assessment Criteria	Maximum marks to be awarded will be given for each item in the exam. It is possible to obtain partial marks based on the marking rubric.
Return Method	Not Returned
Feedback Provided	No Feedback
Opportunity to Reattempt	Students MAY be given the opportunity to reattempt this assessment.

Assessment 2 - Online quiz or in-class quiz or assignment

Assessment Type	In Term Test
Purpose	The progressive in-term assessment is designed to assist students in consolidating key concepts discussed per section. These section assessments will support them for final exam revision.
Description	Assessment 1 will cover basic concepts (bonding, resonance, intermolecular forces and physical properties of organic compounds, functional groups, isomerism, stereochemistry) that constitute 'assumed knowledge' from CHEM1010 and CHEM1020; Assessment 2 will cover lecture materials given in Weeks 3-5; Assessment 3 will cover lecture materials given in Weeks 6-8; Assessment 4 will cover lecture materials given in Weeks 9-12. Assessment 1 is formative in the form of an online quiz. These assessments are online CANVAS quizzes.
Weighting	10%
Length	1 hour for each online quiz
Due Date	Week 5, Week 6, Week 9, Week 12
Submission Method	Online Online via Canvas
Assessment Criteria	Quiz 1 is a formative revision quiz and will help students understand the lecture materials that will be discussed in Weeks 4-12. Assessment items will be provided with assigned marks.
Return Method	Online
Feedback Provided	Online - Quizzes - immediate; in class test - within 2 weeks. Online quiz - immediate feedback. In-class test - within 2 weeks of submission. Immediate feedback after the online quiz. See course coordinator for detailed feedback. For in-class test, comments will be provided on returned work and in person if necessary.

Assessment 3 - Laboratory exercises and reports

Assessment Type	Tutorial / Laboratory Exercises
Purpose	Laboratory exercises develop students' appropriate laboratory skills and professional and safety responsibilities. Written lab reports help students develop their skills in acquisition and interpretation of data and production of articulate and concise documents which convey evidence-based understanding of the concepts and topics.
Description	Details of the experiments and guidelines for report writing are given in the Lab Manual. Students are expected to record and present data and write reports in a format suitable for organic chemistry.
Weighting	30%
Compulsory Requirements	Pass requirement - Must pass this assessment item to pass the course.
Length	No more than 3 h per report
Due Date	See lab schedule and lab manual for details.
Submission Method	Assignment Boxes

Assessment Criteria	Designated box for CHEM2310 outside lab C238.
Return Method	Details are given in the lab manual for each experiment.
Feedback Provided	In Class
Opportunity to Reattempt	Returned Work - Within 2 weeks of submission. Written, and verbal feedback may also be given individually or as a group in class.
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment.

Assessment 4 - Spectroscopy Assessment

Assessment Type	Written Assignment
Purpose	This assessment will examine students' ability to apply spectroscopic techniques in the identification of functional groups and elucidation of the structure of organic compounds.
Description	You will be asked to display your grasp of how to elucidate the structure of a chemical compound using all the techniques covered in the first 2 weeks of lectures and first 3 weeks of workshops.
Weighting	15%
Compulsory Requirements	Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.
Length	3 hours.
Due Date	Week 6.
Submission Method	Online
Assessment Criteria	Quiz questions come with assigned marks. Details will be discussed by the teaching staff during the Week 3 workshop.
Return Method	Online
Feedback Provided	Online - Within 2 weeks of submission. Verbal or annotated on returned work.
Opportunity to Reattempt	Students WILL be given the opportunity to reattempt this assessment.

ADDITIONAL INFORMATION

Grading Scheme

This course is graded as follows:

Range of Marks	Grade	Description
85-100	High Distinction (HD)	Outstanding standard indicating comprehensive knowledge and understanding of the relevant materials; demonstration of an outstanding level of academic achievement; mastery of skills*; and achievement of all assessment objectives.
75-84	Distinction (D)	Excellent standard indicating a very high level of knowledge and understanding of the relevant materials; demonstration of a very high level of academic ability; sound development of skills*; and achievement of all assessment objectives.
65-74	Credit (C)	Good standard indicating a high level of knowledge and understanding of the relevant materials; demonstration of a high level of academic achievement; reasonable development of skills*; and achievement of all learning outcomes.
50-64	Pass (P)	Satisfactory standard indicating an adequate knowledge and understanding of the relevant materials; demonstration of an adequate level of academic achievement; satisfactory development of skills*; and achievement of all learning outcomes.
0-49	Fail (FF)	Failure to satisfactorily achieve learning outcomes. If all compulsory course components are not completed the mark will be zero. A fail grade may also be awarded following disciplinary action.

*Skills are those identified for the purposes of assessment task(s).

Attendance	Attendance/participation will be recorded in the following components: <ul style="list-style-type: none">- Laboratory (Method of recording: Manual checking within 15 minutes of scheduled lab commencement.)
Communication Methods	Communication methods used in this course include: <ul style="list-style-type: none">- Canvas Course Site: Students will receive communications via the posting of content or announcements on the Canvas course site.- Email: Students will receive communications via their student email account.- Face to Face: Communication will be provided via face-to-face meetings or supervision.
Course Evaluation	Each year feedback is sought from students and other stakeholders about the courses offered in the University for the purposes of identifying areas of excellence and potential improvement. As a result of student feedback, the following changes have been made to this offering of the course: <ul style="list-style-type: none">- The order in which the laboratory excursions has been modified as have early experiments to best instruct students as to equipment location and critical experimental techniques.
Oral Interviews (Vivas)	As part of the evaluation process of any assessment item in this course an oral examination (viva) may be conducted. The purpose of the oral examination is to verify the authorship of the material submitted in response to the assessment task. The oral examination will be conducted in accordance with the principles set out in the Oral Examination (viva) Procedure . In cases where the oral examination reveals the assessment item may not be the student's own work the case will be dealt with under the Student Conduct Rule .
Academic Misconduct	All students are required to meet the academic integrity standards of the University. These standards reinforce the importance of integrity and honesty in an academic environment. Academic Integrity policies apply to all students of the University in all modes of study and in all locations. For the Student Academic Integrity Policy, refer to https://policies.newcastle.edu.au/document/view-current.php?id=35 .
Adverse Circumstances	The University acknowledges the right of students to seek consideration for the impact of allowable adverse circumstances that may affect their performance in assessment item(s). Applications for special consideration due to adverse circumstances will be made using the online Adverse Circumstances system where: <ol style="list-style-type: none">1. the assessment item is a major assessment item; or2. the assessment item is a minor assessment item and the Course Co-Ordinator has specified in the Course Outline that students may apply the online Adverse Circumstances system;3. you are requesting a change of placement; or4. the course has a compulsory attendance requirement. Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure available at: https://policies.newcastle.edu.au/document/view-current.php?id=236
Important Policy Information	The Help button in the Canvas Navigation menu contains helpful information for using the Learning Management System. Students should familiarise themselves with the policies and procedures at https://www.newcastle.edu.au/current-students/respect-at-uni/policies-and-procedures that support a safe and respectful environment at the University.

This course outline was approved by the Head of School. No alteration of this course outline is permitted without Head of School approval. If a change is approved, students will be notified and an amended course outline will be provided in the same manner as the original.

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