School of Physical and Chemical Sciences

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

General Course Information

CHEM381
Advanced Synthetic Techniques

0.125 EFTS 15 Points
First Semester 2026

Description
CHEM381 is a 12-week laboratory course specifically designed for those students majoring in chemistry and needing development of technical skills in synthetic chemistry. The focus of the course is on the safe handling and manipulation of organic and inorganic compounds during synthetic sequences. The course will:

- introduce you to advanced synthetic techniques in organic and inorganic chemistry,
- develop your understanding of modern structural elucidation techniques (various spectroscopies and X-ray diffraction), and;
- provide safe, hands-on experience in advanced experimental techniques and in using modern instrumentation.

Timetable
82 hours laboratory work; 14 tutorials

Students should note that in the Science Faculty that the average student is responsible for approximately 4.5 hours of additional study for each hour of lecture at the 300-level.

CHEM381 is a 12-week, two labs per week course running in semester 1. The labs will be held on days as detailed in your timetable in the Ernest Rutherford building, room 412 Chemistry Lab. Unless otherwise noted there will be two tutorial sessions each week as timetabled or at times advised during the course. The experimental work will be carried out in room 412 Chemistry Lab during two 4hrs sessions per week as timetabled. The labs may also be open (to run spectra only) at selected times and days.

The first part of the course is made of up of “core” material introducing you to synthetic techniques, to modern structural elucidation approaches and the theory supporting these techniques through a series of tutorial sessions. The latter part of the course will give you the freedom of selecting from a series of “optional” experiments.

There are no formal final exams associated with the course. All assessment will be carried out during the course. The assessment procedures that will be used are outlined below.

Course Co-ordinator
Prof. Paul Kruger, School of Physical and Chemical Sciences
Julius von Haast room 628, ext 94367 email: paul.kruger@canterbury.ac.nz
Email if you have any queries about the course.

Assessment (subject to change)

Laboratory Assessment:	50%	(Flow sheets 5%; Workbook / 3 x lab write-ups (10% each) and X-ray lab 5%; Technical/practical assessment 10%)
Assignment:	15%	(Based on interpretation of NMR data, spectra etc.)
Tutorial Assessment:	35%	(Test 35%).

Assessment Summary – Key Dates

For each experiment Prepare pre-lab flow sheet, answer any pre-lab questions, and maintain your workbook.

Feedback on progress In or around Week 8 of the course you will be given feedback on your grading up to that date.

Tutorial assessment During the mid-year exam period.

All laboratory classes must be attended, and the prescribed laboratory exercises performed to a satisfactory standard. **Any absence from a class must be satisfactorily explained e.g., by production of a medical certificate.** The course coordinator will advise any student whose laboratory performance is unsatisfactory and will also notify the Head of School. Students must adhere to the laboratory rules as specified in the laboratory manual. A detailed outline of each form of assessment is included in the CHEM381 laboratory manual.

Examination and Formal Tests
A formal written test (35%). Time and venue to be advised, during the mid-year exam period.

Generative AI Tools cannot be used for these assessments In these assessments, you are strictly prohibited from using generative artificial intelligence (AI) to generate any materials or content related to the assessment. This is because students are expected to solve problems and demonstrate knowledge and understanding without the assistance of AI. The use of AI-generated content is not permitted and may be considered a breach of academic integrity. Please ensure that all work submitted is the result of your own human knowledge, skills, and efforts

Textbooks
The CHEM381 laboratory manual will be handed out, free of charge, at your first laboratory session. Tutorial notes will be provided via the Learn page.

Dress for the Laboratory
You are required to wear approved safety glasses, a laboratory coat and appropriate footwear always in the laboratory. ***There are no exceptions to these requirements***. If you already wear glasses, they must be fitted with side-shields and the lenses must be either plastic or hardened glass, otherwise goggles will need to be worn over them. You are advised that if you use contact lenses you should wear goggles rather than safety glasses.

Prerequisites
(1) CHEM281 or BCHM281. It is strongly recommended that CHEM381 be taken in conjunction with appropriate 300 level chemistry lecture courses, particularly CHEM335, 336 and 337.

Goal of the Course
A specialised third year course to build on prior study in chemistry that develops advanced skills in practical synthetic chemistry.

Learning Outcomes
Develop critical analysis skills in chemistry, especially in working structural/chemical elucidation
Develop advanced problem-solving skills
Develop practical skills in the preparation of organic and inorganic compounds
Develop a working understanding of:

- advanced synthetic techniques.
- modern structural elucidation techniques.
- safe working practices in chemical laboratories; and
- chemistry thinking skills.

Summary of the Course Content
Each student will carry out all the **"Core Experiments"** and a selection from the **"Optional Experiments".**

Core Experiments

1. Synthesis of Tetraphenylporphin and its Copper Complex
2. Bis(amino acid)copper(II) Complexes: Preparation and Mannich Reaction
3. Preparation & Acylation of Ferrocene [Bis(cyclopentadienyl)iron(II)]
4. Organoruthenium chemistry
5. Synthesis of Flavone
6. Diels-Alder Addition
7. Studies in X-Ray Crystallography

Optional Experiments

1. A Synthesis of Camphor
2. Preparation of *p*-Carboxystyrene: The Wittig Reaction
3. Reactions of Salicylaldehyde
4. Aniline/Maleic Anhydride Reaction
5. Stereoselective Reduction of Benzoin with Sodium Borohydride: Determination of Stereochemistry by NMR Spectroscopy
6. Magnetochemistry
7. Other additional experiments may be offered at the time depending upon student interest.

GENERAL INFORMATION | TE KIMI MŌHIOHIO 2026

Policy on 'Dishonest Practice'| Ngā Takahitanga me ngā Tinihanga

The University has strict guidelines regarding 'dishonest practice' and 'breach of instructions' in relation to the completion and submission of examinable material. In cases where dishonest practice is involved in tests or other work submitted for credit, a department may choose to not mark such work – see the online guidelines in relation to 'Academic Integrity'.

The School of Physical and Chemical Sciences upholds this policy. It considers plagiarism, collusion, copying and ghost writing – all detailed below – to be unacceptable and dishonest practices:

- ***Plagiarism | Tārua Whānako*** is the presentation of any material (text, data or figures, on any medium including computer files) from any other source without clear and adequate acknowledgement of the source. Note that the use of **AI generative tools such as ChatGPT** for assessment work is *strictly forbidden*, except where the lecturer concerned has specifically granted approval.
- ***Collusion*** is the presentation of work performed in whole, or in part, in conjunction with another person or persons, but submitted as if it has been completed by the named author alone. This interpretation is not intended to discourage students from having discussions about how to approach an assigned task and incorporating general ideas that come from those discussions into their own individual submissions, but acknowledgement is necessary.
- ***Copying*** is the use of material (in any medium, including computer files) produced by another person or persons with or without their knowledge and approval. **This includes copying of the lab reports (raw data may be shared within the group if permitted or required by the experiment) – data analysis and interpretation of obtained results MUST be performed individually.**
- ***Ghost writing*** is the use of other person(s) (whether with or without payment) to prepare all or part of an item of work submitted for assessment.
- ***Generative AI Tools:*** The following shall apply to all assessments in this course, except where a lecturer has specifically stated otherwise in written instructions for an assessment. In all assessments, you are strictly prohibited from using generative artificial intelligence (AI) to generate any materials or content related to the assessment. This is because students are expected to solve problems and demonstrate knowledge and understanding without the assistance of AI. The use of AI-generated content is not permitted and may be considered a breach of academic integrity. Please ensure that all work submitted is the result of your own human knowledge, skills, and efforts

Special consideration of assessment | Ngā Pairuri Motuhake

'Special Consideration' for an item of assessment is for students who have covered the work involved but have been prevented from demonstrating their knowledge or skills at the time of the assessment due to unforeseen circumstances, whether illness, injury, bereavement, car crash or any other extenuating circumstance *beyond*

one's control. Special Consideration for a test/exam may be because a student has not sat it or has done so with impaired performance. Applications can be submitted via the above link and must be made **no later than five working days after the assessment due date**. Note that special consideration is **not available for items worth less than 10% of the overall course mark**. In the case of illness or injury, medical consultation should normally have taken place either shortly before or within 24 hours after the due date for the required work or test/examination.

Note that you may be required to sit a special exam or your grade may not be changed if there is insufficient evidence of your performance from other invigilated assessment items in the course. ***You have the right to appeal any decision.***

It is important to understand that Special Consideration is only available *where course work has been covered*, and the inability to demonstrate this fully is both *no longer possible* AND is due to *unexpected circumstances beyond one's control*. Thus Special Consideration **is NOT available for:**

- essays, assignments or quizzes where an extension of time is available to complete the assessment item (see below for the process to involved);
- missed lectures during the semester;
- experiencing examination anxiety;
- having several examinations or assessments close together;
- known impairment, such as chronic illness (medical or psychological), injury or disability unless medical evidence confirms that the circumstances were exacerbated, despite appropriate management, at the time of assessment;
- mistaking the date or time of an examination (this is a circumstance one can control!);
- failing to turn up to an examination or test because of sleeping in (a circumstance as above!);
- where applications are repeatedly made for the same or similar reason, then the application may be declined on the grounds that the reason is not unexpected;
- where the application is made at the time of the assessment but the supporting documentation is received significantly after this date or after the date results are released; or
- the application is made following the release of results (unless under exceptional circumstances).

Extensions of deadlines | Tononga Wā Āpiti
Where an extension may be granted for an assessment item, this will be decided by application to the course co-ordinator and/or the lecturer concerned.

Late withdrawal from a course
If you are prevented by extenuating circumstances from completing the course after the final date for withdrawing from the course, you may apply for special consideration for late discontinuation. For details on special consideration, or to make an application, refer to the Examinations Office website http://www.canterbury.ac.nz/exams/. Applications must be submitted ***within five days*** of the end of the main examination period for the semester.

Missing of tests | Te Matangaro i ngā Whakamātautau
In rare cases a student will not be able to sit a test. In such cases, the student should consult with the course co-ordinator to arrange alternative procedures. **This must be done well in advance of the set date for the test.**

Past tests and exams
Past tests can be found on our Chemistry Undergraduate website. Past exams can be found on the Library website.

Submission of reports and assignments
Reports (including lab reports) and assignments should be handed in on time. Extensions will be granted only in exceptional circumstances (such as illness or bereavement). If an extension is required, as early as possible you should request it from the lecturer concerned.
Note: If you do not submit an assignment for assessment, you will be allotted zero marks, which will affect your final result. You should ensure that you pick up marked assignments and keep them until the end of the course as evidence that the work was completed and marked in the case that either is disputed. To guard against accidental loss, it would be prudent to keep photocopies or electronic copies of anything submitted.

Late Work
Acceptance of late work for assessment will be at the discretion of the course coordinator and/or the lecturer concerned. If your assessment is likely to be late, please contact the relevant of these people ***before the assessment is due***. Never assume that an extension will be automatically granted – some courses have the policy of no late work being accepted. A commonly exercised policy is to deduct 10% of the total marks for each day that the work is late, where weekends and public holidays also count as such days.

Marks and Grades | Taumata Ako
The following numbers should be considered as a guide to the expected grades under normal circumstances.

Please note that for all invigilated assessments (tests and exams) worth 33% and above, failure to obtain a mark of at least 40% will result in a final grade no higher than an R at 100 and 200 level; in general this requirement will not be applied at 300 level, but if it is then the course coordinator will inform the class and it will result in a final grade no higher than a C–.

Grade:	**A+**	**A**	**A−**	**B+**	**B**	**B−**	**C+**	**C**	**C-**	**D**	**E**
Minimum mark %:	**90**	**85**	**80**	**75**	**70**	**65**	**60**	**55**	**50**	**40**	**0**

The School reserves the right to adjust this mark/grade conversion, up or down, to achieve consistency of assessments standards.

Reconsideration of Grades
Students should, in the first instance, speak to the course co-ordinator about their marks. If they cannot reach an agreeable solution, or have questions about their grade in a course, students should then speak to the Director of Undergraduate Studies, Assoc Prof Greg Russell. Students can appeal any decision made on their final grade. You can apply at the Registry for reconsideration of the final grade within four weeks of the date of publication of final results. Be aware that there are time limits for each step of the appeals process.

Student Accessibility Services | Te Whaikaha
Students can speak with someone at Student Accessibility Service, phone: 369 3334 (or ext. 93334), email: sas@canterbury.ac.nz).

Academic Advice
Assoc Prof Greg Russell is the coordinator of undergraduate chemistry courses. His interest is in the academic performance and well-being of all such students. Anyone experiencing problems with their chemistry courses or requiring guidance about their B.Sc. in Chemistry should get in contact with Greg.

Staff-Class Rep Liaison
Assoc Prof Greg Russell is in charge of liaison with students in chemistry courses. Your class will appoint a student representative to the liaison committee at the start of the semester. Please feel free to talk to the Academic Liaison or the student rep about any problems or concerns that you might have.

Greg Russell (greg.russell@canterbury.ac.nz, tel. 369 5129)
Director of Undergraduate Studies
School of Physical and Chemical Sciences
2026