

## General Course Information

### CHEM381 Advanced Synthetic Techniques

0.125 EFTS      15 Points  
First Semester    2022

#### 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 hands-on experience 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 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  
Room 425 Beatrice Tinsley Building, ext 94367 email: [paul.kruger@canterbury.ac.nz](mailto:paul.kruger@canterbury.ac.nz)  
Email if you have any queries about the course.

#### Assessment (subject to change)

Laboratory Assessment: 55% (Flow sheets 5%; Workbook/lab write-up 35%; Subjective 15%)  
Assignment: 10% (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 last week of term 2 (week 12). Time and venue to be advised.

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 test (35%) will be held during last week of term 2 (week 12). Time and venue to be advised.

### Textbooks

Standard resources plus course textbook(s) and handouts. The CHEM381 laboratory manual will be handed out, free of charge, at your first laboratory session.

### 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 2022

#### Chemistry Department Policy on 'Dishonest Practice'

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 ([Academic Integrity and Breach of Instruction Regulations](#)).

The Department of Chemistry upholds this policy. It considers plagiarism, collusion, copying, and ghost writing to be unacceptable and dishonest practices:

- **Plagiarism** 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.
- **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) (with, or without payment) to prepare all or part of an item of work submitted for assessment.

#### Additional Information

**Special consideration of assessment:** If you feel that illness, injury, bereavement or any other critical extenuating circumstance beyond your control has prevented you from completing an item of assessment or affected your performance in that assessment, you may apply for special consideration. Special consideration is not available for items worth less than 10% of the course. Applications for special consideration should be made **within five days** of the due date for the work or examination. In the case of illness or injury, medical consultation should normally have taken place shortly before, or within 24 hours after, the due date for the required work or the date of the test or examination. For details on special consideration, or to make an application, refer to the Examinations Office website <http://www.canterbury.ac.nz/exams/>. **You have the right to appeal any decision.**

**Extensions of deadlines:** Where an extension may be granted for an assessment item, this will be decided by application to the course co-ordinator.

**Late withdrawal from the 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:** 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:** these can be found on our website using the link below:  
[www.chem.canterbury.ac.nz/for/undergraduate.shtml](http://www.chem.canterbury.ac.nz/for/undergraduate.shtml)

**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 will be at the discretion of the course coordinator. Please contact the coordinator if your assessment is likely to be late.

**Marks and Grades:** The following numbers should be considered as a guide to the expected grades under normal circumstances. The School reserves the right to adjust mark/grade conversions, if necessary.

**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-.**

<b>Grade:</b>	<b>A+</b>	<b>A</b>	<b>A-</b>	<b>B+</b>	<b>B</b>	<b>B-</b>	<b>C+</b>	<b>C</b>	<b>C-</b>	<b>D</b>	<b>E</b>
<b>Minimum mark %:</b>	<b>90</b>	<b>85</b>	<b>80</b>	<b>75</b>	<b>70</b>	<b>65</b>	<b>60</b>	<b>55</b>	<b>50</b>	<b>40</b>	<b>0</b>

**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](mailto:greg.russell@canterbury.ac.nz) (phone 3694228). 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.

**Students with Disabilities:** Students with disabilities should speak with someone at [Equity and Disability Service](http://www.canterbury.ac.nz/equity), phone: 369 3334 (or ext. 93334), email: [eds@canterbury.ac.nz](mailto:eds@canterbury.ac.nz).

**Academic Advice:** [Assoc Prof Greg Russell](mailto:greg.russell@canterbury.ac.nz) 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](mailto:greg.russell@canterbury.ac.nz) 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.

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Director of Undergraduate Studies  
School of Physical and Chemical Sciences  
2022

