

## General Course Information

### CHEM382 Energy, Environmental and Materials Chemistry Lab

0.1250 EFTS      15 Points  
Second Semester    2022

#### Description

This course consists of a series of laboratory experiments and a mini-project. In the initial experiments, you will learn how to apply advanced analytical techniques to characterise the properties of materials and quantify concentrations of chemicals in the environment. In the mini-project you will use the skills you have learned to solve problems in renewable energy production and storage, environmental analysis and materials design. You will also gain numerical problem solving and data analysis skills, communication skills and practice in undertaking self-directed investigations, building creativity and critical thinking skills.

This course is available in the second semester only and counts 15 points towards a BSc or BSc(Hons) degree. It is recommended that CHEM382 be taken in conjunction with appropriate 300-level chemistry lecture courses, particularly CHEM333, CHEM343 and CHEM340.

#### Prerequisites

(CHEM281 or BCHM281) and (CHEM211 or CHEM251 or (CHEM111 and CHEM255)).

#### Assessment

- All** laboratory classes must be attended and the lab work performed to a satisfactory standard. Any absence from a class must be satisfactorily explained, e.g. by a medical certificate.
- The course coordinator will advise any student whose laboratory performance is unsatisfactory and will also notify the Head of School.
- There will be no final examination in this course.
- The overall course mark will be determined as follows:
 

• Reports for seven experiments – <b>compulsory to pass</b> (overall) for course pass	45%
• Test (held in week 8), <i>open-book</i> and <b>compulsory to pass</b> for course pass	20%
• Mini-project	35%
- The mini-project mark will be determined as follows:
 

• <b>Supervisor's assessment</b> of lab work (record keeping in lab books, initiative, understanding, time management, attendance, etc.)	5%
• Project <b>report</b> (marked by supervisor and one other academic)	20%
• <b>Talk</b> on project (marked by two academics)	10%

#### Marks

Marks for experimental reports will be recorded in the Gradebook on Learn. If you believe that any of these marks are in error, please report this to the course co-ordinator immediately.

#### Timetable

This course requires attendance at and participation in 2 x 4 hour lab sessions per week. For lab session times and locations, please consult MyTimetable. You must arrive promptly on time and vacate the lab (or computer room) by or before 10 minutes to the hour it is scheduled to end. The structure of the course is as follows:

First two weeks: whole class completes the set experiment

Next six weeks: 6 from 8 elective experiments completed in small groups of 2-3 students on a rotating roster system

Last four weeks: Students design and carry out a mini-project in small groups of 2-3, extending on or using skills learned in elective experiments.

## Course Content and Organisation of the Course

Each student will carry out experiments in groups, as directed by the person in charge at the time.

<b>Weeks 1 – 2</b>	<b>All students do these experiments at the same time</b>
Experiment 1	Measuring Solar Cell Efficiency & Statistical Analysis of Data
Experiment 2	Spectroscopic Analysis of Gases

<b>Weeks 3 – 8</b>	<b>Elective experiments (chosen in week 1, roster released in week 2), 6 from:</b>
Experiment 3	Atomic Emission Spectroscopy & Quantification of Fluoride in Solution
Experiment 4	Gold Nanoparticles: Solution Properties & Self-Assembly on Silanized Substrates
Experiment 5	Removal of Fluoride from Drinking Water
Experiment 6	Cyclic Voltammetry for Glucose Monitoring
Experiment 7	Viscometry of Polymer Solutions
Experiment 8	Leaching of Metals into Water
Experiment 9	Battery Chemistry
Experiment 10	Dye-Sensitized Solar Cells

### Weeks 9 – 12 Test and mini-projects

Week 9	Day 1	<b>Test</b> (2 hours), plan project, source required reagents & equipment, prepare safety plan
	Day 2	Begin project work after safety plan is signed off.
Week 10	Day 1	Tutorial on project report; project work
	Day 2	Project work
Week 11	Day 1	Tutorial on project talk; project work
	Day 2	Finish project work
Week 12	Day 1	Project practice talks; Revise practice talk; Prepare project report
	Day 2	Assessed talks
	Friday	Hand in project report ( <b>2 copies</b> ) by 5 pm on the last day of semester

### Weekly Requirements – IMPORTANT!

- For the first lab session each week, students must arrive exactly on time (or slightly early), because the introductory talk starting then will address health-and-safety issues for the work at hand. It is a legal requirement that students must be aware of any such issues before commencing the associated experimental work. This means that **anyone who does not arrive on time for the introductory talk will not be able carry out the experiment** (with attendant consequences).
- For the second lab session each week, students must have left the lab by ten minutes to the time it is scheduled to end. Practically, this means that lab work must cease at half past the hour with the final 20 minutes devoted to packing up and cleaning so that your work space and lab equipment is exactly how you found it at the start of the first lab session. If you do not achieve this, **everyone in your group will lose 1 mark out of 10 for the lab report that week**. Keeping your lab space tidy and well organised is a critical lab skill, as is cleaning up after yourself, as is working with others to achieve a common goal.
- Calculations quizzes: Students must be competent in lab-relevant calculations in order to pass the course. At the beginning of the second lab session of week 1, students will be given a quiz with four straight-forward calculation questions (of a chemical nature), with 15 minutes to complete it, and a calculator as the only permitted assistance. Students who attain 100% (marked at the time) are deemed to have met the standard. Students who do not attain 100% will have to complete a similar quiz the next week, and this will continue week after week – either at the beginning of the second lab session or the end of the first – until they can correctly complete all calculations. Any student who cannot do the calculations correctly by the end of the 7<sup>th</sup> lab week cannot pass the course. To assist with revision, worked answers to each calculations set will be placed on Learn after the week's lab sessions.
- Analysis of results and writing-up of lab reports: For these purposes, students should **bring their own laptops to all lab sessions**. PCs in the instrument rooms off ER 412 and 419 may also be used. Mostly these activities will take place in the second lab session each week.

### Laboratory Reports

**Lab reports for a given week's lab must be handed in before the start of the following week's lab.** The academic or demonstrator in charge of a given lab or experiment will let you know how to submit your lab report and what format it should take. **If you require an extension for completing your report, you should contact the marker for the experiment concerned**, stating the reason for your request. This must be done **before** the report is due. You will be advised if the request is accepted. Otherwise **late reports will result in deduction of marks**.

**Two A4-size exercise books** are required for recording data in the lab, as they may be required to be handed in for assessment in alternate weeks, along with your lab report.

## Absences from Labs

Any unexplained absence from a lab session can result in **failure of the course**, and *at the very least* will result in loss of marks for that experiment. If you have a reason for missing a lab, then please provide it to the course coordinator (Deb Crittenden, [deborah.crittenden@canterbury.ac.nz](mailto:deborah.crittenden@canterbury.ac.nz)) as soon as practicably possible. Documentary evidence (e.g. a medical certificate, funeral notice) is required. You should also advise the marker of the experiment you are missing. They will come to an arrangement with you about writing a report for the experiment concerned. **No more than two weeks of laboratory time may be missed, even with explained absence.** A laboratory course requires *doing* of laboratory experiments.

## Laboratory Manual

The CHEM 382 laboratory manual will be distributed in your first laboratory, and is available electronically on LEARN.

## Safety in the Laboratory

You must read the Departmental Safety Rules at the beginning of the lab manual. Note in particular:

1. **Students and staff must wear safety glasses and laboratory coats in laboratories and workshops at all times**, except for those areas that have been officially exempted from this requirement, or as instructed by the laboratory supervisor.
2. **Proper footwear must be worn in all laboratories and workshops.** The whole foot must be protected and non-skid soles are recommended.

If you already wear glasses, they must be fitted with side-shields and the lenses must either be plastic or hardened glass, otherwise goggles will need to be worn over your glasses. You are advised that if you wear contact lenses you should have goggles not safety glasses.

## People

### Course Coordinator

A/Prof Deborah Crittenden [deborah.crittenden@canterbury.ac.nz](mailto:deborah.crittenden@canterbury.ac.nz)

### Laboratory technical officer

Dr Nathan Alexander [nathan.alexander@canterbury.ac.nz](mailto:nathan.alexander@canterbury.ac.nz)

### Academic staff involved in the course

Prof Sally Gaw [sally.gaw@canterbury.ac.nz](mailto:sally.gaw@canterbury.ac.nz)  
A/Prof Vladimir Golovko [vladimir.golovko@canterbury.ac.nz](mailto:vladimir.golovko@canterbury.ac.nz)  
A/Prof Sarah Masters [sarah.masters@canterbury.ac.nz](mailto:sarah.masters@canterbury.ac.nz)  
Prof Brett Robinson [brett.robinson@canterbury.ac.nz](mailto:brett.robinson@canterbury.ac.nz)  
A/Prof Greg Russell [greg.russell@canterbury.ac.nz](mailto:greg.russell@canterbury.ac.nz)  
A/Prof Deborah Crittenden [deborah.crittenden@canterbury.ac.nz](mailto:deborah.crittenden@canterbury.ac.nz)

### Demonstrator

Joel Schuurmann [joel.schuurmann@pg.canterbury.ac.nz](mailto:joel.schuurmann@pg.canterbury.ac.nz)

## Learning Outcomes

Mastery of the course content listed above, as demonstrated by your performance in the laboratory and in the various assessment components.

## Goal of the Course

To obtain advanced practical skills in the application of instrumental methods to solve problems in physical, analytical and environmental chemistry and materials science.

## GENERAL INFORMATION 2022

### 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 School of Physical and Chemical Sciences 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, and a C- at 300 level.**

<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](#) (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](#), phone: 369 3334 (or ext. 93334), email: [eds@canterbury.ac.nz](mailto:eds@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](mailto:greg.russell@canterbury.ac.nz), tel. 369 5129)  
Director of Undergraduate Studies  
School of Physical and Chemical Sciences  
2022