Course Outline

CHEM3031

Metals in Life and Technology

School of Chemistry

Faculty of Science

Term 2, 2021

1. **Staff**

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	Dr. Scott Andrew Sulway	s.sulway@ unsw.edu.au	By appointment - Dalton 134	ex:55236

2. Course information

Units of credit: 6

Pre-requisite(s): CHEM2031

Teaching times and locations:

http://www.timetable.unsw.edu.au

2.1 Course summary

This course provides insight into the current state-of-art research where metals are used in technologies such as semiconductors, batteries, solar cells, superconductors, and where metals are used in life such as photochemical processes & nitrogen fixation.

2.2 Course aims

This course showcases the importance of understanding the role of the metals in life and technology. The key components of structural characterization relevant to this understanding are covered and the function derived from the structure expanded. The way chemistry can be used to tune structure and hence properties is shown to underpin all of these technologies and processes in life.

Learning outcomes (TLO mapping 1.1, 1.2, 1.3, 2.1.2, 2.1.3, 2.1.5, 2.1.6, 2.1.7, 3.2, 3.3, 3.4, 4.1, 4.2, 5.1, 5.2, 5.3)

Students are expected to:

Be able to describe a range of cutting edge characterisation methods used to analyse inorganic compounds and applying said knowledge to correctly identify compounds (1.1, 1.2, 1.3, 2.1.2, 2.1.3, 2.1.7, 3.3)

Display a comprehensive knowledge of the chemistry of solid state materials and how this applies to modern technologies (ranging from semiconductors to superconductors to solar cells) (1.3, 2.1.3, 2.1.5)

Understand and describe the reaction mechanisms that can occur in inorganic chemistry (2.1.5, 2.1.6)

Understand the function and molecular properties of bio-inorganic systems (1.2, 2.1.5, 2.1.6)

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Describe a range of cutting edge characterisation methods used to analyse inorganic compounds and applying said knowledge to correctly identify compounds
2. Display a comprehensive knowledge of the chemistry of solid state materials and how this applies to modern technologies (ranging from semiconductors to superconductors to solar cells)
3. Understand and describe the reaction mechanisms that can occur in inorganic chemistry
4. Understand the function and molecular properties of bio-inorganic systems

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Program Learning Outcome (PLO)	Related Tasks & Assessment
CLO 1	Describe a range of cutting edge characterisation methods used to analyse inorganic compounds and applying said knowledge to correctly identify compounds	Chemistry Threshold Learning Outcomes - 1.1, 1.2, 1.3, 2.1.2, 2.1.3, 2.1.7, 3.3	6 Practical Reports, Examination & 3 Assignments
CLO 2	Display a comprehensive knowledge of the chemistry of solid state materials and how this applies to modern technologies (ranging from semiconductors to superconductors to solar cells)	Chemistry Threshold Learning Outcomes - 1.3, 2.1.3, 2.1.5	6 Practical Reports, Examination & 3 Assignments
CLO 3	Understand and describe the reaction mechanisms that can occur in inorganic chemistry	Chemistry Threshold Learning Outcomes - 2.1.5, 2.1.6	6 Practical Reports, Examination & 3 Assignments
CLO 4	Understand the function and molecular properties of bio-inorganic systems	Chemistry Threshold Learning Outcomes - 1.2, 2.1.5, 2.1.6	6 Practical Reports, Examination & 3 Assignments

3. Strategies and approaches to learning

3.1 Learning and teaching activities

In this course we utilise lectures, seminar and laboratory-based teaching methods. The lectures will be pre-recorded with activities to do after each. We will then have engaging interactive workshops to help cement your learning from the lectures. Seminars will allow students to ask questions of industrial chemists, allowing them to gain insight into the chemistry profession (pending availability).

Laboratory activities by their very nature are interactive and hands-on, we also seek to make the most of students' time in laboratories by engaging in group work (including presentation of data and discussion activities). We also have laboratory practicals that involve students' having to conduct independent studies/research in order to solve complex tasks/problems, this will allow students to develop their critical analysis and problem-solving skills.

3.2 Expectations of students

Expectations of students, include:

- Watch the lecture material and complete activities set before workshop sessions
- Attend workshops and actively participate in the activities therein
- Be fully prepared for and attend laboratory sessions
- Complete all assignments by specified deadlines
- Engage in private study equal to the number of hours of face-to-face contact

4. Course schedule and structure

This course consists of 80 hours of class contact hours. You are expected to take an additional 80 hours of non-class contact hours to complete assessments, readings and exam preparation.

Week [Date/Session]	Topic [Module]	Activity [Learning opportunity]	Related CLO
Week 1	Intro sessions	1 hours of Lectures (intro)	CLO1
Week 2	Group Theory and IR Spectroscopy	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO1, CLO 2
Week 3	Advanced NMR Spectroscopy (Inc. Solid State)	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO 3
Week 4	UV and Term Symbols	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO 3, CLO 4
Week 5	Lanthanide Chemistry and Magnetism	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO 3, CLO 4
Week 6			
Week 7	Cutting edge inorganic characterisation methods	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO1, CLO 2
Week 8	Neutron scattering and properties of solid state materials	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO 3
Week 9	Solid state chemistry - I	2 hours of Lectures, 2 hours of workshop, 1 lab	CLO1, CLO 2
Week 10	Solid state chemistry - II	2 hours of Lectures, 2 hours of workshop	CLO1, CLO 2

5. Assessment

5.1 Assessment tasks

Assessment task	Length	Weight	Mark	Due date (normally midnight on due date)
Assessment 1: 6 Practical Reports	~10 hrs, each report will consist of several pages of lab write up	30%	Graded via rubric, feedback will be delivered via Moodle.	Dates spaced throughout semester – see course pack/Moodle
Assessment 2: Examination	Online via Moodle, open-book, mix of multi-choice and short answer	55%	Total mark will be displayed on paper, each question will clearly depict associated mark	End of T2 – Exam period
Assessment 3: 3 Assignments	Each will be a few pages in length	15%	Mark will be given out of 15 for each	Dates spaced throughout semester – see course pack/Moodle

Important note: To be awarded a pass in this subject, students must satisfy three conditions:

(i) An overall pass (≥ 50%) in the laboratory component, and
(ii) Satisfactory overall performance (≥ 35%) in the final examination, and
(iii) A minimum attendance of 80% in laboratories is required.

Failure to satisfy all criteria could result in either a FL or UF (Unsatisfactory Fail) grade being awarded, or further assessment being offered at the sole discretion of the course coordinator. Students must ensure their availability to attend any supplementary examination that will usually be offered in the week suggested by UNSW; inability or failure to attend a supplementary examination may lead to a FL or UF (Unsatisfactory Fail) grade being confirmed.

Further information

UNSW grading system: https://student.unsw.edu.au/grades

UNSW assessment policy: https://student.unsw.edu.au/assessment

5.2 Assessment criteria and standards

Assessment criteria and associated rubrics for all assignments and laboratory practicals can be found on Moodle. Feedback for assignments will be provided on the associated rubric(s).

5.3 Submission of assessment tasks

All lab reports and assignments must be submitted by the due date and time via Moodle and may be subject to plagiarism checks. Late submissions will be accepted but carry a 10% penalty per day up to one week (7 days) late, after which a 100% penalty will then be applied (weekends and public holidays count in determining late penalties). The penalty is applied to the total for the assignment not to the mark obtained (i.e. you submit a report 2 days late but would have scored 70% if it was on-time, your mark will be adjusted to 50% given the 20% late penalty). Extensions of deadlines will only be granted via applications to the centralised special consideration unit (if eligible). This information is also available on Moodle.

5.4. Feedback on assessment

Lab reports and assignments will be graded using the associated rubrics on Moodle. Additional comments will also be given on the rubrics or reports to inform students where they can improve. All feedback will be given in a timely manner and we aim to have this occur within a week of submission.

6. Academic integrity, referencing and plagiarism

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.[1] 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 and **plagiarism** can be located at:

- The *Current Students* site https://student.unsw.edu.au/plagiarism, and
- The *ELISE* training site http://subjectguides.library.unsw.edu.au/elise/presentation

The *Conduct and Integrity Unit* provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

7. Readings and resources

Inorganic Chemistry 5th Edition, CE Housecroft and AG Sharpe, 2018

8. Administrative matters

Course contact: Dr. Scott A Sulway (s.sulway@unsw.edu.au)

Additional information can be found on the UNSW School of Chemistry website:

http://www.chemistry.unsw.edu.au/

9. Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/skills
- Student Wellbeing, Health and Safety: https://student.unsw.edu.au/wellbeing
- Disability Support Services: https://student.unsw.edu.au/disability
- UNSW IT Service Centre: https://www.it.unsw.edu.au/students/index.html

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.