School of Science

CHEM3580: Colloids, Interfaces and Soft Matter

Callaghan

Semester 1 - 2026

COURSE OUTLINE

OVERVIEW

Course Description

This course introduces students to colloid and interface science. Key surface chemistry concepts are introduced, including the role of surface energy and adsorption of molecules at phase boundaries or interfaces. In introducing colloidal materials, emphasis is placed on the methods of their preparation and structure-property relationships. Dissolved polymers are ubiquitous in everyday formulations and thus the behaviour of polymers in solution is investigated. The self-assembly of amphiphiles into soft materials including micelles, liquid crystals and microemulsions is examined, and the relationship between these structures and formulations in which they are used is explained. The laboratory component provides training in techniques which are specific to the preparation, characterisation and simulation of dilute and concentrated surfactant and polymer solutions, and colloidal dispersions. Throughout the course, the relationship between the structure and properties of the materials and their performance in household, environmental and industrial applications will be highlighted.

Academic Progress Requirements

Nil

Requisites

Course Pre-Requisite:
Must have successfully completed the following course(s):
CHEM2210
CHEM2410

Students who have completed either CHEM2410 or CHEM2210 together with CHEM2310 prior to 2022 should email Science-SELS@newcastle.edu.au to enrol in CHEM3580.

Assumed Knowledge

CHEM2210 Materials ChemistryCHEM2410 Physical Chemistry

Contact Hours

Callaghan
Computer Lab *
Face to Face On Campus
3 hour(s) per week(s) for 3 week(s) starting Week 10

Laboratory *
Face to Face On Campus
3 hour(s) per week(s) for 9 week(s) starting Week 1

Lecture
Face to Face On Campus
1 hour(s) per week(s) for 12 week(s) starting Week 1

Lecture
Face to Face On Campus
2 hour(s) per week(s) for 12 week(s) starting Week 1

Tutorial
Face to Face On Campus
1 hour(s) per week(s) for 12 week(s) starting Week 1

* This contact type has a compulsory requirement.

Unit Weighting 10

Workload Students are required to spend on average 120-140 hours of effort (contact and non-contact) including assessments per 10 unit course.

CONTACTS

Course Coordinator

Callaghan
Prof Erica Wanless
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Consultation: By email appointment - room C217 Chemistry Building

Teaching Staff Other teaching staff will be advised on the course Canvas site.

School Office

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9am-5pm (Mon-Fri)

SYLLABUS

Course Content

- Chemistry of Interfaces - surface energy, adsorption, the solid-gas interface, the solid-liquid interface, the liquid-gas interface
- Colloid Chemistry - classification and preparation of colloidal materials, theory and control of colloid stability
- Simulating Interfaces - atomistic molecular dynamics, course-grained models
- Polymer Solutions - thermodynamics of polymer dissolution, polymer conformation and size in solution
- Polymer and Colloid Characterisation - characterisation of polymer solutions and colloidal dispersions – size, shape and structural analysis
- Soft Matter - surfactant self-assembly, lyotropic liquid crystals, structured gels and particles, formulations and applications

Course Learning Outcomes

On successful completion of this course, students will be able to:

1. Relate the structure and properties of surface active and polymer molecules, and colloidal materials to their performance and intended applications;

2. Describe the different approaches to the classification and preparation of colloidal materials and soft matter;

3. Describe the use of surface-active, soft matter and colloidal materials in household, industrial and environmental applications;

4. Demonstrate competence in the use of various procedures and instruments for the synthesis and/or characterisation of surface-active molecules, soft matter and colloidal materials;

5. Apply the scientific process in the conduct and reporting of experimental investigation;

6. Demonstrate an awareness of the safety responsibilities involved in working with chemicals and hazardous substances.

Course Materials

Recommended Reading:

- D.J. Shaw, Introduction to Colloid and Surface Chemistry, Butterworths, 4th Ed., 1992.
- T. Cosgrove (Ed.), Colloid Science: Principles, Methods and Applications, Blackwell, 2005.
- D. Fennell Evans & H. Wennerström, The Colloidal Domain: Where Physics, Chemistry, Biology and Technology Meet, VCH Publishers, 1994.
- Barnes, G.T., Gentle, I.R., Interfacial Science: an Introduction, Oxford University Press, 2011.
- Adamson, A.W., Gast A.P., Physical Chemistry of Surfaces, 6th Edition, Wiley, 1997.
- Jensen, F., Introduction to Computational Chemistry, 2 Edition, Wiley, 2013.
- Cramer, C., Essentials of Computational Chemistry: Theories and Models, 2 Edition, Wiley, 2004.

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
- Computer Lab Has compulsory attendance

Course Assessment Requirements:

- Assessment 1 - In Term Tests: Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.
- Assessment 3 - Laboratory Reports: Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.
- Assessment 4 - Lab Performance and Skill Assessment: Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.

Compulsory Placement and WHS Requirements:

- Induction

SCHEDULE

Week	Week Begins	Topic	Learning Activity	Assessment Due
1	27 Jan	Chemistry of Interfaces - surface energy, adsorption (EW)	Lectures, Tutorial and Labs	Lab Performance and Skill Assessment (EW) In term test (5%, EW)
2	2 Feb	Chemistry of Interfaces - adsorption, the liquid-gas interface (EW)	Lectures, Tutorial but no Labs	In term test (5%, EW)
3	9 Feb	Chemistry of Interfaces - the solid-gas interface, the solid-liquid interface(EW)	Lectures, Tutorial and Labs	In term test (5%, EW) Lab Performance and Skill Assessment (EW)
4	16 Feb	Colloid Chemistry - classification and fundamentals of colloidal	Lectures, Tutorial and Labs	In term test (5%, EW) Lab Performance and Skill Assessment (EW)

		materials (EW)		Lab report 1 (EW)
5	23 Feb	Colloid Chemistry - theory and control of colloid stability (EW)	Lectures, Tutorial and Labs	In term test (5%, EW) Lab Performance and Skill Assessment (EW)
6	2 Mar	Particle synthesis including size & shape control (QS)	Lectures, Tutorial and Labs	In term test (5%, QS) Lab Performance and Skill Assessment (QS) Lab report 2 (EW)
Recess				
7	16 Mar	Particle synthesis including size & shape control (QS)	Lectures, Tutorial and Labs	In term test (5%, QS) Lab Performance and Skill Assessment (QS)
8	23 Mar	Characterisation of polymer solutions and colloidal dispersions – size, shape and structural analysis (QS)	Lectures, Tutorial and Labs	In term test (5%, QS) Lab Performance and Skill Assessment (QS) Lab report 3 (QS)
9	30 Mar	Characterisation of polymer solutions and colloidal dispersions – size, shape and structural analysis (QS)	Lectures, Tutorial and Labs	In term test (5%, QS) Lab Performance and Skill Assessment (QS)
10	6 Apr	Simulating condensed phases and interfaces - atomistic molecular dynamics (AP)	Lectures, Tutorial and Labs	In term test (5%, AP) Lab Performance and Skill Assessment (QS) Lab report 4 (QS) Draft presentation slides (5%)
11	13 Apr	Simulating condensed phases and interfaces - atomistic molecular dynamics (AP)	Lectures, Tutorial and Labs	In term test (5%, AP) Lab Performance and Skill Assessment (AP) Lab report 5 (AP)
12	20 Apr	Simulating condensed matter and interfaces - atomistic molecular dynamics (AP)	Lectures, Tutorial and Labs	In term test (5%, AP) Lab Performance and Skill Assessment (AP) Lab report 6 (AP) Presentation at Chemistry level 3000 showcase on 22 April (5%)
Exams				Lab report 7 (AP)
Exams				

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	In Term Tests*	Weekly in weeks 1-12.	Individual	60%	1, 2, 3
2	Oral Presentation	Draft slide due on Canvas in Week 10. Presentation during Undergraduate Chemistry showcase on Friday of Week 12.	Individual	10%	1, 2, 3, 5
3	Laboratory Reports*	One week after the last laboratory session for each experiment.	Individual	15%	1, 2, 3, 4, 5, 6
4	Lab Performance and Skill Assessment*	During Lab classes.	Group	15%	4, 5, 6

* 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 up to 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 - In Term Tests

Assessment Type In Term Test
Purpose Lecture assessment designed to embed skills associated with each section of the course. Mixture of descriptive questions and calculations as appropriate.
Description The format of these weekly 5% assessment items will vary from textual responses to Excel exercises to Canvas quizzes. The weekly tutorial will be devoted to working on these items.
Weighting 60%
Compulsory Requirements Pass requirement 40% - Must obtain 40% in this assessment item to pass the course.
Length As advised in class/Canvas.
Due Date Weekly in weeks 1-12.
Submission Method Online
Canvas upload or Quiz.
Assessment Criteria Students must submit all tests. Written responses meet the course objectives of knowledge acquisition and demonstrated assimilation of data, upon reflection and analysis, to produce articulate and concise documents which convey evidence-based understanding of the concepts and topics.
Return Method Online
Feedback Provided Online - Two weeks after submission. Feedback will be written on uploaded assessment item.
Opportunity to Reattempt Students will be given the opportunity to reattempt this assessment.

Assessment 2 - Oral Presentation

Assessment Type Presentation
Purpose To probe more deeply into the course through research a topic of interest to more than one of the lecture sections. Topics will be assigned to groups.
Description A short group presentation on an assigned topic.
Weighting 10%
Length As advised in class/Canvas.
Due Date Draft slide due on Canvas in Week 10. Presentation during Undergraduate Chemistry showcase on Friday of Week 12.
Submission Method Online
Draft slide to be uploaded to Canvas for assessment.
Assessment Criteria The purpose and benefit of oral presentations is to develop oral communication skills, synthesise an opinion and convey this clearly in a well-presented and articulate manner.

Return Method	In Class Online
Feedback Provided	Online - Within one week on the draft slides, and in person on the day of the presentation. Written feedback on draft slides. In class feedback on oral presentation.
Opportunity to Reattempt	Students will not be given the opportunity to reattempt this assessment.

Assessment 3 - Laboratory Reports

Assessment Type	Report
Purpose	Report in the prescribed format describing the activities, outcomes and conclusions from each experiment undertaken.
Description	The report format is described in the course laboratory manual. Interfaces & colloids lab reports 1-4: 2.5% each, Computational interfaces reports 5% total.
Weighting	15%
Compulsory Requirements	Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.
Length	As advised in class/Canvas.
Due Date	One week after the last laboratory session for each experiment.
Submission Method	Assignment Boxes Online Physical copies of Experiments 1-4 with cover sheets are to be submitted in the appropriate report box outside the laboratory. Computational reports (weeks 10-12) to be submitted via Canvas.
Assessment Criteria	Students must submit all reports and obtain an overall mark of at least 50% to pass the course. Practical & computational laboratory work is the central component of chemistry by which knowledge is advanced, and the means by which professional chemists contribute to an understanding of real-world problems. Each report needs to introduce the relevance of the experiment and explain results together with the related theoretical background.
Return Method	In Class
Feedback Provided	Returned Work - Two weeks after submission of report. Feedback will be written on marked report
Opportunity to Reattempt	Students will not be given the opportunity to reattempt this assessment.

Assessment 4 - Lab Performance and Skill Assessment

Assessment Type	Practical Demonstration
Purpose	To assess student preparation for, and conduct of, each experiment.
Description	Students are expected to read the references provided in the lab manual, and draft a risk assessment prior to coming to the lab class. All laboratory data must be recorded in a bound laboratory notebook and/or Excel workbook and/or Jupyter notebook. Initial data analysis should be conducted in Excel and/or Jupyter during class. Performance of the laboratory group will also be assessed. Interfaces & colloids lab assessments on experiments1-4: 2.5% each, Computational interfaces workshop assessment 5% total.
Weighting	15%
Compulsory Requirements	Pass requirement 50% - Must obtain 50% in this assessment item to pass the course.
Length	As advised in class/Canvas.
Due Date	During Lab classes.
Submission Method	In Class
Assessment Criteria	Assessment of performance in the laboratory course, the quality of results and observational skills recorded in laboratory notebook, initial data analysis during class, risk assessment, and group work.
Return Method	In Class
Feedback Provided	Online - Two weeks after the conclusion of the experiment. Feedback will be uploaded to Canvas
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:

- Laboratory (Method of recording: Method of recording: Students to complete the laboratory induction in week 1 prior to starting laboratory work. Students to sign the laboratory attendance register each week.)

Students must participate in and submit laboratory reports for the established minimum requirements.

Communication Methods

Communication methods used in this course include:

- 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:

- Timetable requested to schedule laboratory session later in the week than the lectorials.

Learning Analytics

The University uses an evidence-based approach to enhancing student learning and delivering support. Our careful analysis of data through learning analytics informs decision making processes related to student learning, academic outcomes, and support services. Learning analytics may be used to identify targeted individual opportunities for additional support services or interventions.

Interviews on Assessment Items

An Interview may be conducted on any assessment item in this course, in accordance with the Interview on Assessment Items Procedure. The purpose of the interview is to verify the author of the material submitted in response to the assessment task and provide a quality

assurance measure.

In the event the Course Coordinator is not satisfied that a student's oral responses are consistent with the work originally submitted, the matter will be referred to the Student Academic Conduct Officer, who will take appropriate action under the Student Conduct Rule.

Academic Integrity and Ethical Academic Conduct Policy

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.

Please refer to the Academic Integrity and Ethical Academic Conduct Policy

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:

1. the assessment item is a major assessment item; or
2. 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; or
4. the course has a compulsory attendance requirement.

Before applying you must refer to the Adverse Circumstance Affecting Assessment Items Procedure.

Use of generative artificial intelligence in course assessments

It is critical that any work submitted for assessment is your own original work. Before using generative AI tools (such as ChatGPT, Perplexity, Microsoft Copilot, etc) in any assessable work you must ensure that such use is in line with the requirements for the course and expectations of your Course Coordinator

Misuse of AI tools may be considered a breach of the University's Student Conduct Rule and could result in disciplinary action.

Artificial Intelligence detection software may be used to review any work you submit. If you have used AI in any way other than has been expressly permitted by your course coordinator, you may be engaging in academic misconduct and be subject to penalties.

For information, refer to:

- Generative AI Tools
- Academic Integrity

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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