



UNSW Course Outline

MATS4006 Polymer Science and Engineering 2 - 2024

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General Course Information

Course Code : MATS4006

Year : 2024

Term : Term 3

Teaching Period : T3

Is a multi-term course? : No

Faculty : Faculty of Science

Academic Unit : School of Materials Science & Engineering

Delivery Mode : In Person

Delivery Format : Standard

Delivery Location : Kensington

Campus : Sydney

Study Level : Undergraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

The course focuses on advanced polymers, including but not limited to polymers in dielectrics, optoelectronics, solar technology, and medicine. It expands on concepts taught in MATS3004 Polymer Science and Engineering I. Students will learn about polymerization techniques used to

produce polymers and copolymers with enhanced functionalities, the rubber elasticity theory that governs the behavior of elastomeric materials and networks, and the rheological property of polymer melts critical for their industrial processing. The course also covers failure mode of polymeric products while in usage. The course includes lab activities intended as a practical companion to the concepts taught in the lectures, thereby, enabling the student with a technology-enhanced learning experience.

Course Aims

The aim of the course is to provide the students with foundations in the fundamentals of polymer physics. This will be taught through the rubber elasticity theory, rheological properties, and viscoelasticity. The course also aims to familiarize the students with up-to-date breakthroughs in the application and synthesis of functional polymers. Practical aspects of polymer engineering will be taught such as the shift to sustainable polymers and the failure modes of polymers subject to environmental conditions.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Assess relevant parameters vital in design consideration of polymers for specific applications.
CL02 : Evaluate processing-structure-properties relationships in different classes of polymers.
CL03 : Identify bulk properties of polymers and their degradation mechanisms.
CL04 : Execute experimental work for the synthesis and characterization of polymers.
CL05 : Analyze scientific data and demonstrate scientific writing.

Course Learning Outcomes	Assessment Item
CL01 : Assess relevant parameters vital in design consideration of polymers for specific applications.	<ul style="list-style-type: none"> • Mid-Term Test • Individual Assignment • Final exam
CL02 : Evaluate processing-structure-properties relationships in different classes of polymers.	<ul style="list-style-type: none"> • Mid-Term Test • Individual Assignment • Final exam
CL03 : Identify bulk properties of polymers and their degradation mechanisms.	<ul style="list-style-type: none"> • Individual Assignment • Final exam
CL04 : Execute experimental work for the synthesis and characterization of polymers.	<ul style="list-style-type: none"> • Lab Work
CL05 : Analyze scientific data and demonstrate scientific writing.	<ul style="list-style-type: none"> • Lab Work

Learning and Teaching Technologies

Moodle - Learning Management System

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Lab Work Assessment Format: Individual	20%	
Mid-Term Test Assessment Format: Individual	30%	
Individual Assignment Assessment Format: Individual	20%	
Final exam Assessment Format: Individual	30%	

Assessment Details

Lab Work

Assessment Overview

You will complete laboratory activities spread over the term. Each lab activity is of two hours' duration, intended for you to design and execute experimental methods. Through hands-on activities, you will learn about polymer degradation, network formation and gelation, viscosity measurement, polymer synthesis, and 3D printing of polymeric scaffolds.

You are required to write an individual scientific report including data analysis for each lab activity you complete. The lab report is due one week after you have completed the lab activity. You will receive your marked report with feedback before the following report is due so you can build on the feedback and improve your scientific writing.

Course Learning Outcomes

- CL04 : Execute experimental work for the synthesis and characterization of polymers.
- CL05 : Analyze scientific data and demonstrate scientific writing.

Detailed Assessment Description

You will complete laboratory activities spread over the term. Each lab activity is of two hours' duration, intended for you to design and execute experimental methods. Through hands-on activities, you will learn about polymer degradation, network formation and gelation, viscosity

measurement, polymer synthesis, and 3D printing of polymeric scaffolds.

You are required to write an individual scientific report including data analysis for each lab activity you complete. The lab report is due one week after you have completed the lab activity. You will receive your marked report with feedback before the following report is due so you can build on the feedback and improve your scientific writing.

Generative AI Permission Level

No Assistance

This assessment is designed for you to complete without the use of any generative AI. You are not permitted to use any generative AI tools, software or service to search for or generate information or answers.

For more information on Generative AI and permitted use please see [here](#).

Mid-Term Test

Assessment Overview

You will sit for a written test in Week 5 covering the content taught in Weeks 1-4. The test is typically of two hours' duration including 10 minutes reading time. Questions typically include multiple choice, short answers, and problem solving. The test is designed to assess your understanding of advanced synthesis of polymers, their viscoelasticity and rheological properties, and the rubber elasticity theory.

You will receive your marked test indicating what questions were answered correctly and incorrectly. Overall comments and worked solutions may be provided to the class.

Hurdle requirement: You are required to achieve > 35% in the Mid-term Test and > 35% in the Final Exam, and > 45% weighted average over the two exams for satisfactory completion of the course. If you fail to achieve this, you will be awarded an Unsatisfactory Fail (UF) for the course regardless if you receive over 50% in total for the course.

Course Learning Outcomes

- CL01 : Assess relevant parameters vital in design consideration of polymers for specific applications.
- CL02 : Evaluate processing-structure-properties relationships in different classes of polymers.

Detailed Assessment Description

You will sit for a written test in Week 5 covering the content taught in Weeks 1-4. The test

is typically of two hours' duration including 10 minutes reading time. Questions typically include multiple choice, short answers, and problem solving. The test is designed to assess your understanding of advanced synthesis of polymers, their viscoelasticity and rheological properties, and the rubber elasticity theory. Feedback may be available upon request from the course convenor. Overall comments and worked solutions may be provided to the class.

Hurdle rules

To pass this course you are required to achieve a 45% weighted average over the mid-term test and final exam, with a minimum mark of 35% achieved in each of the tasks.

Generative AI Permission Level

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Individual Assignment

Assessment Overview

You will complete an assignment that requires the submission of two reports with equal weighting of 10% each. Report 1 is due in Week 4 and Report 2 is due in Week 10. The assignment is designed to build on the knowledge learned in the lectures. You are required to choose a commercial product and the polymer it is made from. You need to report on the synthesis of the polymer, fabrication and processing of the product, its degradation and mechanical properties, and input on how to improve the product design.

The report you submit in Week 4 is to assess your progress. You will be given individualized feedback on your report. Feedback on the final report due in Week 10 will be provided upon request from the course convenor.

Course Learning Outcomes

- CL01 : Assess relevant parameters vital in design consideration of polymers for specific applications.
- CL02 : Evaluate processing-structure-properties relationships in different classes of polymers.
- CL03 : Identify bulk properties of polymers and their degradation mechanisms.

Detailed Assessment Description

You will complete an assignment that requires the submission of two reports with

equal weighting of 10% each. Report 1 is due in Week 4 and Report 2 is due in Week 10. The assignment is designed to build on the knowledge learned in the lectures. You are required to choose a commercial product and the polymer it is made from. You need to report on the synthesis of the polymer, fabrication and processing of the product, its degradation and mechanical properties, and input on how to improve the product design. The report you submit in Week 4 is to assess your progress. You will be given individualized feedback on your report. Feedback on the final report due in Week 10 will be provided upon request from the course convenor.

Generative AI Permission Level

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Final exam

Assessment Overview

You will sit a Final Exam covering the content taught in Weeks 5 and 7-10. The exam is typically of two hours' duration including 10 minutes reading time and conducted during the official exam period. Questions typically include multiple choice, short answers, and problem solving. The test is designed to assess your understanding of natural and functional polymers, and failure modes of polymers while in usage.

Feedback is available through inquiry with the course convenor.

Hurdle requirement: You are required to achieve > 35% in the Mid-term Test and > 35% in the Final Exam, and > 45% weighted average over the two exams for satisfactory completion of the course. If you fail to achieve this, you will be awarded an Unsatisfactory Fail (UF) for the course regardless if you receive over 50% in total for the course.

Course Learning Outcomes

- CL01 : Assess relevant parameters vital in design consideration of polymers for specific applications.
- CL02 : Evaluate processing-structure-properties relationships in different classes of polymers.
- CL03 : Identify bulk properties of polymers and their degradation mechanisms.

Detailed Assessment Description

You will sit a Final Exam covering the content taught in Weeks 5 and 7-10. The exam is typically of two hours' duration including 10 minutes reading time and conducted during the official exam period. Questions typically include multiple choice, short answers, and problem solving. The test is designed to assess your understanding of natural and functional polymers, and failure modes of polymers while in usage. Feedback is available through inquiry with the course convenor.

Hurdle rules

To pass this course you are required to achieve a 45% weighted average over the mid-term test and final exam, with a minimum mark of 35% achieved in each of the tasks.

Generative AI Permission Level

No Assistance

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General Assessment Information

Short Extensions:

The School of Materials Science and Engineering has reviewed its range of assignments and projects to determine their suitability for automatic shortextensions as set out by the UNSW Short Extension Policy. After consultation with teaching staff and examination of our course offerings, we consider our current deadline structures already accommodate the possibility of unexpected circumstances that may lead students to require additional days for submission. Consequently, the School does not offer the Short Extension provision in its MATS courses but students, if needed, can apply for formal Special Consideration via the usual procedure.

Grading Basis

Standard

Requirements to pass course

To pass this course you are required to achieve a 45% weighted average over the mid-term test and final exam, with a minimum mark of 35% achieved in each of the tasks.

Course Schedule

Attendance Requirements

Students are strongly encouraged to attend all classes and review lecture recordings.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Damia Mawad		Level 2, Room 246, E10 Hilmer Building			No	Yes
Lecturer	Kristopher Kilian		Level 7, Room 740, E10 Hilmer Building			No	No

Other Useful Information

Academic Information

Upon your enrolment at UNSW, you share responsibility with us for maintaining a safe, harmonious and tolerant University environment.

You are required to:

- Comply with the University's conditions of enrolment.
- Act responsibly, ethically, safely and with integrity.
- Observe standards of equity and respect in dealing with every member of the UNSW community.
- Engage in lawful behaviour.
- Use and care for University resources in a responsible and appropriate manner.
- Maintain the University's reputation and good standing.

For more information, visit the [UNSW Student Code of Conduct Website](#).

Academic Honesty 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. 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, plagiarism and the use of AI in assessments can be located at:

- The [Current Students site](#),
- The [ELISE training site](#), and
- The [Use of AI for assessments](#) site.

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

Submission of Assessment Tasks

Penalty for Late Submissions

UNSW has a standard late submission penalty of:

- 5% per day,
- for all assessments where a penalty applies,
- capped at five days (120 hours) from the assessment deadline, after which a student cannot submit an assessment, and
- no permitted variation.

Any variations to the above will be explicitly stated in the Course Outline for a given course or assessment task.

Students are expected to manage their time to meet deadlines and to request extensions as early as possible before the deadline.

Special Consideration

If circumstances prevent you from attending/completing an assessment task, you must officially apply for special consideration, usually within 3 days of the sitting date/due date. You can apply by logging onto myUNSW and following the link in the My Student Profile Tab. Medical documentation or other documentation explaining your absence must be submitted with your application. Once your application has been assessed, you will be contacted via your student email address to be advised of the official outcome and any actions that need to be taken from there. For more information about special consideration, please visit: [https://](#)

Important note: UNSW has a “fit to sit/submit” rule, which means that if you sit an exam or submit a piece of assessment, you are declaring yourself fit to do so and cannot later apply for Special Consideration. This is to ensure that if you feel unwell or are faced with significant circumstances beyond your control that affect your ability to study, you do not sit an examination or submit an assessment that does not reflect your best performance. Instead, you should apply for Special Consideration as soon as you realise you are not well enough or are otherwise unable to sit or submit an assessment.

Faculty-specific Information

Additional support for students

- [The Current Students Gateway](#)
- [Student Support](#)
- [Academic Skills and Support](#)
- [Student Wellbeing, Health and Safety](#)
- [Equitable Learning Services](#)
- [UNSW IT Service Centre](#)
- Science EDI Student [Initiatives](#), [Offerings](#) and [Guidelines](#)