



UNSW Course Outline

MATS6001 Fundamentals of Materials Processing - 2024

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General Course Information

Course Code : MATS6001

Year : 2024

Term : Term 1

Teaching Period : T1

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 : Postgraduate

Units of Credit : 6

Useful Links

[Handbook Class Timetable](#)

Course Details & Outcomes

Course Description

The first section of this course includes an introduction to processing of inorganic materials, semiconductor processing, single crystal growth of Si, GaAs, carbon-based material, thin film processing (physical and chemical vapour deposition), sputtering and pulse laser deposition

methods. It shall also cover advanced nanostructures such as nanoparticles, nanowires, nanotubes, wet chemical production methods, electro-less and electrochemical production methods. In addition, this section will cover sustainable materials processing of waste plastic, electronics waste processing and sustainable iron and Steel making.

Course material covered in the second section includes secondary metals processing such as fixed and continuous casting processes including sand-box casting, investment casting, die-casting, slab and twin-roll strip-casting; metal billet and sheet rolling; tube and bar extrusion; forging techniques; Soldering, Brazing and Welding, Subtractive manufacturing including multi-axis milling, machining, grinding and spark erosion; Additive manufacturing including typical 3D printing techniques such as extrusion melting, selective laser melting/sintering, e-beam melting and droplet ejection.

Course Aims

This course covers selected topics in materials processing methods and sustainable materials production. Students will understand the basic elements of operations of processing used for semiconductors and single crystal growth, advanced nanostructures, thin film deposition and processing. In addition, primary metal refinement and assorted secondary processing and shaping methods such as casting, rolling, welding, subtractive- and additive manufacturing are covered in detail.

Course Learning Outcomes

Course Learning Outcomes
CL01 : Explain the basic concepts and economic drivers in materials processing.
CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.
CL03 : Solve problems by applying knowledge of processing methods, techniques and conditions to specific real-world applications.
CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.

Course Learning Outcomes	Assessment Item
CL01 : Explain the basic concepts and economic drivers in materials processing.	<ul style="list-style-type: none">• Quiz 1• Mid-term Test• Quiz 2• Final examination
CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.	<ul style="list-style-type: none">• Quiz 1• Mid-term Test• Quiz 2• Final examination
CL03 : Solve problems by applying knowledge of processing methods, techniques and conditions to specific real-world applications.	<ul style="list-style-type: none">• Mid-term Test• Final examination
CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.	<ul style="list-style-type: none">• Quiz 1• Quiz 2• Mid-term Test• Final examination

Learning and Teaching Technologies

Moodle - Learning Management System | Echo 360

Assessments

Assessment Structure

Assessment Item	Weight	Relevant Dates
Quiz 1 Assessment Format: Individual	10%	Due Date: Week 2: 19 February - 25 February
Mid-term Test Assessment Format: Individual	40%	Due Date: Week 4: 04 March - 10 March
Quiz 2 Assessment Format: Individual	10%	Due Date: Week 9: 08 April - 14 April
Final examination Assessment Format: Individual	40%	Start Date: Exam period Due Date: Exam period

Assessment Details

Quiz 1

Assessment Overview

This quiz is designed to assess your understanding of the topics covered in lectures during weeks 1-2 inclusive. Quiz 1 will typically be scheduled in-class during week 2 as a single attempt with a time limit of 1 hour. The quiz consists of short question answers only, with details which will be confirmed during the course. Feedback will be provided within two weeks of completing the quiz through the gradebook and answer sheet to link incorrect answers to topic learning outcomes, and via a generalised class feedback discussion in lectures.

Course Learning Outcomes

- CL01 : Explain the basic concepts and economic drivers in materials processing.
- CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.
- CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.

Mid-term Test

Assessment Overview

The mid-term test is designed to assess your understanding of the topics covered in lectures from weeks 1-4 inclusive. The test will typically be scheduled in-class during week 4 or 5 as a single attempt with a time limit of 1.5 hours. You will be assessed on your ability to apply theory, technologies and concepts learnt throughout the first half of the course. The test will typically include a set of short written-response and longer written-response questions.

Feedback will be provided within two weeks of completing the quiz through the gradebook and via a generalised class feedback during lectures or individual feedback discussions.

Course Learning Outcomes

- CL01 : Explain the basic concepts and economic drivers in materials processing.
- CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.
- CL03 : Solve problems by applying knowledge of processing methods, techniques and conditions to specific real-world applications.
- CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.

Hurdle rules

Satisfactory completion of the course includes the requirement to achieve $\geq 35\%$ in the mid-term exam and $\geq 35\%$ in the final exam, and $\geq 45\%$ weighted average over the two exams. Students who fail to achieve this will be awarded an Unsatisfactory Fail (UF) grade for the course regardless if they receive over 50% in total for the course.

Quiz 2

Assessment Overview

This quiz is designed to assess your understanding of the topics covered in lectures during weeks 7-8 inclusive. Quiz 2 will typically be scheduled in-class during week 9 as a single attempt with a time limit of 1 hour. The quiz consists of short question answers only, with details which will be confirmed during the course. Feedback will be provided with two weeks of completing the quiz through the gradebook and answer sheet to link incorrect answers to topic learning outcomes, and via a generalised class feedback discussion in lectures.

Course Learning Outcomes

- CL01 : Explain the basic concepts and economic drivers in materials processing.
- CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.
- CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.

Final examination

Assessment Overview

The final examination is designed to assess your understanding of the topics covered in lectures from weeks 6-10 inclusive. The test will typically be scheduled during the examination period with a time limit of 2 hours. You will be assessed on your ability to apply theory, technologies and

concepts learnt throughout the second half of the course. The test will typically include a set of short one-word answer questions, short written-response and longer written, diagram or tabulated response questions.

Feedback will be provided through the gradebook or individual feedback discussions upon appointment.

Course Learning Outcomes

- CL01 : Explain the basic concepts and economic drivers in materials processing.
- CL02 : Identify the distinguishing features of different types of primary and secondary processing techniques and their commercial applications.
- CL03 : Solve problems by applying knowledge of processing methods, techniques and conditions to specific real-world applications.
- CL04 : Communicate knowledge of processing methods and production concepts using precise language and correct field terminology in written format.

Hurdle rules

Satisfactory completion of the course includes the requirement to achieve $\geq 35\%$ in the mid-term exam and $\geq 35\%$ in the final exam, and $\geq 45\%$ weighted average over the two exams. Students who fail to achieve this will be awarded an Unsatisfactory Fail (UF) grade for the course regardless if they receive over 50% in total for the course.

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 short extensions 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

Satisfactory completion of the course includes the requirement to achieve $\geq 35\%$ in the mid-term exam and $\geq 35\%$ in the final exam, and $\geq 45\%$ weighted average over the two exams. Students who fail to achieve this will be awarded an Unsatisfactory Fail (UF) grade for the course

regardless if they receive over 50% in total for the course.

Course Schedule

Teaching Week/Module	Activity Type	Content
Week 1 : 12 February - 18 February	Lecture	Intro to Inorganic Materials (SL) Semiconductor Properties (SL) Semiconductor Materials Processing and Single Crystal Growth (SL)
Week 2 : 19 February - 25 February	Lecture	Thin Film Technology – Vacuum Evaporation (SL) PLD and CVD methods (SL)
	Assessment	Quiz 1
Week 3 : 26 February - 3 March	Lecture	Nanomaterials Processing (SL) Nanoparticles Nanowires, CNT and Graphene (SL) Chemical Processing of Materials (SL)
Week 4 : 4 March - 10 March	Lecture	Sustainable Materials Processing (SL) Course Study Review (SL)
	Assessment	Mid-Term Test
Week 5 : 11 March - 17 March	Other	No scheduled lecture
Week 6 : 18 March - 24 March	Other	Week six is known as 'flexi week', no classes are held this week to give students an opportunity to focus on assessable tasks and revising course content.
Week 7 : 25 March - 31 March	Lecture	Intro to Materials Processing Primary Metals Processing Casting Processes (I)
Week 8 : 1 April - 7 April	Lecture	Casting Processes (II) Metal Rolling & Extrusion Forging Processes
Week 9 : 8 April - 14 April	Lecture	Joining Processes (I) Joining Processes (II)
	Assessment	Quiz 2
Week 10 : 15 April - 21 April	Lecture	Additive & Subtractive Manufacturing Course Study Review

Attendance Requirements

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

Course Resources

Recommended Resources

- F. C. Campbell, Metal Fabrication ASM International 2013, ISBN:978-1-62708-018-7
- Joanna R. Groza, James F. Shackelford, Materials Processing Handbook 2007, ISBN 9780849332166.
- William F. Smith, Principles of Materials Science and Engineering 3 rd edition 1999, ISBN 978-0072396591.

Staff Details

Position	Name	Email	Location	Phone	Availability	Equitable Learning Services Contact	Primary Contact
Convenor	Akif Kaynak		E10 Room 238		By appointment	No	Yes
Lecturer	Sean Li		E10 Room 520	93855986	By appointment	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://student.unsw.edu.au/special-consideration>

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](#)