



MMAN4200

Additive Manufacturing

Term Two // 2021

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Xiaopeng Li	xiaopeng.li@unsw.edu.au	Microsoft Teams Video Chat Hours: Wednesday 1400-1700	Room 311B, J17	

School Contact Information

Location

UNSW Mechanical and Manufacturing Engineering

Ainsworth building J17, Level 1

Above Coffee on Campus

Hours

9:00–5:00pm, Monday–Friday*

*Closed on public holidays, School scheduled events and University Shutdown

Web

[School of Mechanical and Manufacturing Engineering](#)

[Engineering Student Support Services](#)

[Engineering Industrial Training](#)

[UNSW Study Abroad and Exchange](#) (for inbound students)

[UNSW Future Students](#)

Phone

(+61 2) 9385 8500 – Nucleus Student Hub

(+61 2) 9385 7661 – Engineering Industrial Training

(+61 2) 9385 3179 – UNSW Study Abroad and UNSW Exchange (for inbound students)

(+61 2) 9385 4097 – School Office**

**Please note that the School Office will not know when/if your course convenor is on campus or

available

Email

[Engineering Student Support Services](#) – current student enquiries

- e.g. enrolment, progression, clash requests, course issues or program-related queries

[Engineering Industrial Training](#) – Industrial training questions

[UNSW Study Abroad](#) – study abroad student enquiries (for inbound students)

[UNSW Exchange](#) – student exchange enquiries (for inbound students)

[UNSW Future Students](#) – potential student enquiries

- e.g. admissions, fees, programs, credit transfer

[School Office](#) – School general office administration enquiries

- NB: the relevant teams listed above must be contacted for all student enquiries. The School will only be able to refer students on to the relevant team if contacted

Course Details

Credit Points 6

Summary of the Course

Additive manufacturing, also known as 3D printing, is an emerging advanced manufacturing technique which has enjoyed a rapid growth in recent years. It has been considered as a national strategic priority in many countries in Europe and North America, and this field of research is expected to grow even faster in the near future in Australia. Due to its layer-wise fabrication process, additive manufacturing is not only a disruptive technology that will complement many traditional manufacturing techniques but is also a major technique in the future to enable new business models, new products and new supply chains to flourish.

This course will introduce you to the fundamental aspects of additive manufacturing. This course will focus on various additive manufacturing techniques where you will gain basic knowledge and theory about the history, development and fundamental engineering aspects of this technique. You will also cover additive manufacturing process optimization including the selection and use of materials as well as look at the current major applications where additive manufacturing is used in addition to investigating the future development of this emerging manufacturing technique.

Course Aims

This course aims to provide an introduction to the fundamental and important aspects of additive manufacturing, in terms of additive manufacturing techniques, additive manufacturing process optimization and design for additive manufacturing. This course will also offer the students first-hand experience in additive manufacturing techniques.

Course Learning Outcomes

After successfully completing this course, you should be able to:

Learning Outcome	EA Stage 1 Competencies
1. Understand the fundamental basis and nature of additive manufacturing techniques	PE1.1, PE1.3, PE1.5, PE2.2, PE3.6
2. Explain the principles and develop a systematic plan for additive manufacturing process optimisation	PE1.1, PE1.3, PE1.5, PE2.3, PE3.6
3. Plan and execute appropriate design process for additive manufacturing	PE1.3, PE1.5, PE2.2, PE2.4, PE3.2, PE3.6
4. Be able to relate additive manufacturing to other manufacturing techniques	PE1.1, PE1.3, PE1.5, PE2.3, PE3.6

Teaching Strategies

The subject will be presented in the form of lectures and workshops. Each weekly class will consist of an hour of a workshop example or case study related to the material covered in the previous lecture in the first hour and followed by 1-2 hrs lecture. One lab project will also be included for the students to have

first-hand experience in additive manufacturing.

Additional Course Information

The lectures from week 1 to 4 will focus on various additive manufacturing techniques up to date where you will gain basic knowledge about the history, development and fundamental engineering aspects of this technique. The lecture in week 8 will be a presentation on the lab project. The lecture in week 9 will cover additive manufacturing process optimization, including materials for additive manufacturing, properties of additive manufacturing fabricated components, and applications of additive manufacturing, e.g. aerospace, automotive, biomedical, and arts and design. Week 9 will also cover additive manufacturing design where you will use commercially available software to design advanced structures for additive manufacturing. The lectures in week 10 will introduce current major applications of additive manufacturing and provide a perspective for future development of this emerging manufacturing technique.

Aside from lectures and workshops, this course also includes demonstrations where you will have first-hand experience in various additive manufacturing machines available in the School of Mechanical and Manufacturing Engineering.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Final exam	40%	Not Applicable	1, 2, 3, 4
Online quizzes	10%	Each Thursday 10 am Sydney time	1, 2, 3, 4
Assignment 1	25%	Week 8	1, 2, 3, 4
Lab project	25%	Week 8	1, 2, 3, 4

Assessment Details

Assessment 1: Final exam

Start date: Not Applicable

Length: 8 questions, 2 hours

Details: 2 hours

Additional details:

Deadline for absolute fail is n/a

Assessment 2: Online quizzes

Start date: Each Wednesday 10 am Sydney time

Length: 2 quiz questions for each week, 1 hour

Details:

Online quizzes based on weekly lectures

Additional details:

Deadline for absolute fail is each Thursday 10 am Sydney time. Marks will be returned with one week.

Submission notes: Submitted via Moodle

Assessment 3: Assignment 1

Start date: Week 4

Length: 3500 words

Details:

This assignment requires each student or a group of students (depending on the number of the enrolled students) to write an essay based on given topics about additive manufacturing. The topics will be provided to the students in week 4.

Additional details:

Deadline for absolute fail is 5 days after due date. Marks will be returned with two weeks.

Submission notes: Submission via Moodle

Assessment 4: Lab project

Start date: Week 4

Length: 1 group presentation and project report

Details:

For the online Lab project, students will be divided into several groups and a small, flexible project will be given to each group. Each project will be focused on polymer or metal additive manufacturing where you will need to design a real component for 3D printing. You will also need to talk about how your group work together to design and fabricate the component using 3D printers in your online group presentation. The assessment for the project will be based on the team's work, your understanding of the 3D printing process, and your group online presentation.

Additional details:

Deadline for absolute fail is 5 days after due date. Marks will be returned with two weeks.

Submission notes: Submission via Teams

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
O Week: 25 May - 28 May		
Week 1: 31 May - 4 June	Lecture	Introduction to additive manufacturing; Moodle Recorded Lecture/Class readings
Week 2: 7 June - 11 June	Lecture	Metal additive manufacturing; Moodle Recorded Lecture/Class readings
Week 3: 14 June - 18 June	Lecture	Polymer additive manufacturing; Moodle Recorded Lecture/Class readings
Week 4: 21 June - 25 June	Lecture	Ceramic additive manufacturing; Moodle Recorded Lecture/Class readings
Week 5: 28 June - 2 July	Group Activity	Online lab project and flexibility week
Week 6: 5 July - 9 July	Group Activity	Online lab project and flexibility week
Week 7: 12 July - 16 July	Group Activity	Online lab project and flexibility week
Week 8: 19 July - 23 July	Group Work	A project study and design; Moodle Recorded Lecture/Class readings
Week 9: 26 July - 30 July	Lecture	Additive manufacturing process optimisation and design for additive manufacturing; Moodle Recorded Lecture/Class readings
Week 10: 2 August - 6 August	Lecture	Additive manufacturing applications and future of additive manufacturing; Moodle Recorded Lecture/Class readings

Resources

Recommended Resources

- a. UNSW Library website: <https://www.library.unsw.edu.au/>
- b. Moodle: <https://moodle.telt.unsw.edu.au/login/index.php>

Course Evaluation and Development

Feedback on the course is gathered periodically using various means, including the UNSW myExperience process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

Laboratory Workshop Information

Online projects will be assisted by three demonstrators and software package will also be provided for remote access.

Submission of Assessment Tasks

Assessment submission and marking criteria

Should the course have any non-electronic assessment submission, these should have a standard School cover sheet.

All submissions are expected to be neat and clearly set out. Your results are the pinnacle of all your hard work and should be treated with due respect. Presenting results clearly gives the marker the best chance of understanding your method; even if the numerical results are incorrect.

Marking guidelines for assignment submissions will be provided at the same time as assignment details to assist with meeting assessable requirements. Submissions will be marked according to the marking guidelines provided.

Late policy

Work submitted late without an approved extension by the course coordinator or delegated authority is subject to a late penalty of 20 percent (20%) of the maximum mark possible for that assessment item, per calendar day.

The late penalty is applied per calendar day (including weekends and public holidays) that the assessment is overdue. There is no pro-rata of the late penalty for submissions made part way through a day.

Work submitted after the 'deadline for absolute fail' is not accepted and a mark of zero will be awarded for that assessment item.

For some assessment items, a late penalty may not be appropriate. These are clearly indicated in the course outline, and such assessments receive a mark of zero if not completed by the specified date. Examples include:

1. Weekly online tests or laboratory work worth a small proportion of the subject mark, or
2. Online quizzes where answers are released to students on completion, or
3. Professional assessment tasks, where the intention is to create an authentic assessment that has an absolute submission date, or
4. Pass/Fail assessment tasks.

Examinations

You must be available for all quizzes, tests and examinations. For courses that have final examinations, these are held during the University examination periods: February for Summer Term, May for T1, August for T2, and November/December for T3.

Please visit myUNSW for Provisional Examination timetable publish dates. For further information on exams, please see the [Exams](#) webpage.

Special Consideration

If you have experienced an illness or misadventure beyond your control that will interfere with your

assessment performance, you are eligible to apply for Special Consideration prior to submitting an assessment or sitting an exam.

UNSW now has a [Fit to Sit / Submit rule](#), which means that if you attempt an exam or submit a piece of assessment, you are declaring yourself fit enough to do so and cannot later apply for Special Consideration.

For details of applying for Special Consideration and conditions for the award of supplementary assessment, please see the information on UNSW's [Special Consideration page](#).

Please note that students will **not** be required to provide **any** documentary evidence to support absences from any classes missed **because of COVID-19 public health measures such as isolation**. UNSW will **not** be insisting on medical certificates from anyone deemed to be a positive case, or when they have recovered. Such certificates are difficult to obtain and put an unnecessary strain on students and medical staff.

Applications for special consideration **will** be required for assessment and participation absences – but no documentary evidence **for COVID 19 illness or isolation** will be required.

Academic Honesty and Plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as using the words or ideas of others and passing them off as your own.*

Plagiarism is a type of intellectual theft. It can take many forms, from deliberate cheating to accidentally copying from a source without acknowledgement. UNSW has produced a website with a wealth of resources to support students to understand and avoid plagiarism, visit: student.unsw.edu.au/plagiarism. The Learning Centre assists students with understanding academic integrity and how not to plagiarise. They also hold workshops and can help students one-on-one.

You are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting and the proper referencing of sources in preparing all assessment tasks.

If plagiarism is found in your work when you are in first year, your lecturer will offer you assistance to improve your academic skills. They may ask you to look at some online resources, attend the Learning Centre, or sometimes resubmit your work with the problem fixed. However more serious instances in first year, such as stealing another student's work or paying someone to do your work, may be investigated under the Student Misconduct Procedures.

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:

www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Academic Information

Credit points

Course credit is calculated in Units-Of-Credit (UOC). The normal workload expectation for one UOC is approximately 25 hours per term. This includes class contact hours, private study, other learning activities, preparation and time spent on all assessable work.

Most coursework courses at UNSW are 6 UOC and involve an estimated 150 hours to complete, for both regular and intensive terms. Each course includes a prescribed number of hours per week (h/w) of scheduled face-to-face and/or online contact. Any additional time beyond the prescribed contact hours should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

On-campus class attendance

Public distancing conditions must be followed for all face-to-face classes. To ensure this, only students enrolled in those classes will be allowed in the room. No over-enrolment is allowed in face-to-face classes. Students enrolled in online classes can swap their enrolment from online to a **limited** number of on-campus classes by Sunday, Week 1. Please refer to your course's Microsoft Teams and Moodle sites for more information about class attendance for in-person and online class sections/activities.

Your health and the health of those in your class is critically important. You must stay at home if you are sick or have been advised to self-isolate by [NSW health](#) or government authorities. Current alerts and a list of hotspots can be found [here](#). **You will not be penalised for missing a face-to-face activity due to illness or a requirement to self-isolate.** We will work with you to ensure continuity of learning during your isolation and have plans in place for you to catch up on any content or learning activities you may miss. Where this might not be possible, an application for fee remission may be discussed. Further information is available on any course Moodle or Teams site.

In certain classroom and laboratory situations where physical distancing cannot be maintained or there is a high risk that it cannot be maintained, face masks will be considered **mandatory PPE** for students and staff.

For more information, please refer to the FAQs: <https://www.covid-19.unsw.edu.au/safe-return-campus-faqs>

Guidelines

All students are expected to read and be familiar with UNSW guidelines and policies. In particular, students should be familiar with the following:

- [Attendance](#)
- [UNSW Email Address](#)
- [Special Consideration](#)
- [Exams](#)
- [Approved Calculators](#)
- [Academic Honesty and Plagiarism](#)

Important Links

- [Moodle](#)
- [Lab Access](#)
- [Computing Facilities](#)
- [Student Resources](#)
- [Course Outlines](#)
- [Faculty Transitional Arrangements for COVID-19](#)
- [Makerspace](#)
- [UNSW Timetable](#)
- [UNSW Handbook](#)
- [Equitable Learning Services](#)

Image Credit

Synergies in Sound 2016

CRICOS

CRICOS Provider Code: 00098G

Acknowledgement of Country

We acknowledge the Bedegal people who are the traditional custodians of the lands on which UNSW Kensington campus is located.

Appendix: Engineers Australia (EA) Professional Engineer Competency Standard

Program Intended Learning Outcomes	
Knowledge and skill base	
PE1.1 Comprehensive, theory based understanding of the underpinning natural and physical sciences and the engineering fundamentals applicable to the engineering discipline	✓
PE1.2 Conceptual understanding of the mathematics, numerical analysis, statistics, and computer and information sciences which underpin the engineering discipline	
PE1.3 In-depth understanding of specialist bodies of knowledge within the engineering discipline	✓
PE1.4 Discernment of knowledge development and research directions within the engineering discipline	
PE1.5 Knowledge of engineering design practice and contextual factors impacting the engineering discipline	✓
PE1.6 Understanding of the scope, principles, norms, accountabilities and bounds of sustainable engineering practice in the specific discipline	
Engineering application ability	
PE2.1 Application of established engineering methods to complex engineering problem solving	
PE2.2 Fluent application of engineering techniques, tools and resources	✓
PE2.3 Application of systematic engineering synthesis and design processes	✓
PE2.4 Application of systematic approaches to the conduct and management of engineering projects	✓
Professional and personal attributes	
PE3.1 Ethical conduct and professional accountability	
PE3.2 Effective oral and written communication in professional and lay domains	✓
PE3.3 Creative, innovative and pro-active demeanour	
PE3.4 Professional use and management of information	
PE3.5 Orderly management of self, and professional conduct	
PE3.6 Effective team membership and team leadership	✓