

MANF4150

Design of Intelligent Manufacturing Systems

Term 1, 2022



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Shiva Abdoli	s.abdoli@unsw.edu.au	Consultation concerning this course is available on Monday 12:00 –15:00 whenever the lecturer is not otherwise engaged.	Ainsworth Building (J17)	(02) 9385 6851

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

Important Links

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

Course Details

Units of Credit 6

Summary of the Course

This course introduces the key concepts of Industry 4.0, which focuses on integrating physical elements of production systems with information and communication technologies.

Industry 4.0 reflects the ongoing fourth industrial revolution and is one of the most popular research and industry topics. In the context of industry 4.0, the digitalization of factory and production elements and associated communication transforms today's factories into smart ones. This offers great business opportunities and economic potential, including increasing production system productivity, improving product quality and customization, shorter lead times, and reduced environmental footprints. Smart factories are sprouting up all over the globe and they can range in size from the very small to the very large. Many of these systems are now being established in Australia. This discipline is therefore becoming increasingly important in industrial and manufacturing engineering.

This course provides students with a comprehensive understanding of key concepts and enabling technologies of industry 4.0 such as artificial intelligence, Big Data analytics, robotics, simulation, additive manufacturing, digital twin, and the Internet of Things (IoT). The course analyses the social aspect of smart factories equipped with the industrial internet of things and investigates the offering opportunities and possible risks.

Course Aims

This course aims to educate the students in the best state of research and practice in the design, planning, and control of cyber-physical production systems that interconnect products, machines, networks, and autonomous systems that continuously communicate and cooperate.

Course Learning Outcomes

1. List and describe the major categories of smart devices and individual building blocks of manufacturing systems and their associated characteristics and performance measures, as well as their role in the design and control of smart factories in an Industry 4.0 context.
2. Be able to identify and work with available standards and protocols of system design, data communication/ transmission, and cyber security in the context of the Internet of Things.
3. List, describe and explain different data acquisition strategies and protocols as well as decision-making strategies based on knowledge gained in key analytical techniques including data visualisation and big data analytics.
4. Identify and define issues relating to the challenges in designing smart factories and have the ability to make and communicate decisions in the design and planning of these factories, based on validated engineering methods and an understanding of different stakeholders.

Teaching Strategies

The subject will be presented in the form of lectures and tutorials. Weekly lectures include the theoretical content and case studies as demonstrations. The course material will be delivered as lectures slides, associated book chapters, readings, and demonstration cases. To enhance students' understanding, case studies and examples are discussed in class. Examinations and quizzes will test the understanding

of basic theory and key concepts of industry 4.0. Students will achieve a deeper understanding by means of assignments, while they design a manufacturing system architecture, incorporate the industry 4.0 concepts, and orchestrating engineering methods.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Quizzes	15%	07/03/2022 12:00 AM	1
2. Group Assignment	15%	20/03/2022 12:00 AM	2, 3
3. Individual Project	20%	17/04/2022 12:00 AM	1, 2, 3, 4
4. EXAM	50%	Not Applicable	1, 2, 3, 4

Assessment 1: Online Quizzes

Start date: 28/02/2022 12:00 AM

Assessment length: 10 questions

Due date: 07/03/2022 12:00 AM

Deadline for absolute fail: N/A

Marks returned: 1 week after submission

The online quiz covers the lecture material in Week 1 and inclusive. It will be held online on Moodle. Feedback will be available shortly after the quiz has finished.

This is not a Turnitin assignment

Assessment 2: Group Assignment

Start date: 08/03/2022 12:00 AM

Assessment length: 1000 words

Due date: 20/03/2022 12:00 AM

Deadline for absolute fail: 2 weeks after the submission deadline

Marks returned: 2 weeks after submission deadline

The students will do a group activity in designing manufacturing systems in groups of 3-4 students.

This is not a Turnitin assignment

Assessment criteria

The students apply the modelling concepts to design a manufacturing system.

Assessment 3: Individual Project

Start date: 28/03/2022 12:00 AM

Assessment length: 1500 words

Due date: 17/04/2022 12:00 AM

Marks returned: 2 weeks after submission deadline

The individual project addresses including the industry 4.0 technologies in the design of a specific manufacturing system.

This is not a Turnitin assignment

Assessment criteria

This project requires proper application of industry 4.0 technologies in the context of system design.

Assessment 4: EXAM

Assessment length: 2 hours exam

Deadline for absolute fail: N/A

This is the final exam of the subject.

Assessment criteria

The exam covers all the content delivered in the course.

Additional details

The exam includes descriptive, numerical and multiple choice questions.

Attendance Requirements

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

Course Schedule

[View class timetable](#)

Timetable

Date	Type	Content
Week 1: 14 February - 18 February	Lecture	Introduction and definitions
Week 2: 21 February - 25 February	Lecture	Manufacturing system characteristics and design methods
Week 3: 28 February - 4 March	Lecture	Modeling and Systems Engineering
Week 4: 7 March - 11 March	Lecture	Digital Twin and Simulation
Week 5: 14 March - 18 March	Lecture	Internet of Things
Week 6: 21 March - 25 March	Reading	Readings are provided in the Flexibility week.
Week 7: 28 March - 1 April	Lecture	Artificial Intelligence and Big data
Week 8: 4 April - 8 April	Lecture	Industrial Robotics
Week 9: 11 April - 15 April	Lecture	3D Printing
Week 10: 18 April - 22 April	Lecture	Industry Speaker

Resources

Prescribed Resources

Lecture slides, lecture notes and articles are provided for the students.

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, for a minimum of zero marks.

The late penalty is applied per calendar day (or part thereof), including weekends and public holidays, that the assessment is overdue.

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

- Your course has an assessment task worth a total of **30 marks (Max Possible Mark)**
- You submit the assessment **2 days after the due date**
- The assessment is marked as usual and achieves a score of **20 marks (Awarded Mark)**
- The late policy is applied using **Late Mark = Awarded Mark - (Days*Penalty per Day)*Max Possible Mark**. Your adjusted final score is **8 marks** ($20 - ((2*0.2)*30)$).

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.

Special Consideration Outcomes

Assessments have default Special Consideration outcomes. The default outcome for the assessment will be advised when you apply for Special Consideration. Below is the list of possible outcomes:

Outcome	Explanation	Example
Time extension	Student provided more time to submit the assessment	e.g. 1 more week of time granted to submit a report
Supplementary assessment	Student provided an alternate assessment at a later date/time	e.g. a supplementary exam is scheduled during the supplementary exam period of the term
Substitute item	The mark for the missed assessment is substituted with the mark of another assessment	e.g. mark for Quiz 1 applied also applied as mark for Quiz 2, meaning if a student achieved a mark of 20/30 for Quiz 1 and was granted Special Consideration for Quiz 2, a mark of 20/30 would be applied for Quiz 2, etc
Exemption	All course marks are recalculated excluding this assessment and its weighting	e.g. The course has an assessment structure of: - Assignments 30%, - Lab report 30%, - Final Exam 40%. If the Lab report is missed and student is granted Special Consideration, then the assessment structure may be reweighted as follows: - Assignments 50% - Final Exam 50% as though the Lab report did not exist
Non-standard	Course Coordinator is contacted for the outcome when special consideration is granted as the outcome differs on a case-by-case basis	e.g. typical for group assessments where time extension supplementary assessment could be granted to the group member, time extension could be granted to the whole group, etc. Clarify with your Course Convenor for

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

****T1-2022 UPDATE****

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 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](#)

Image Credit

Photo by Stephen Blake March 2017, Willis Annexe (J18) Thermofluids lab

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.