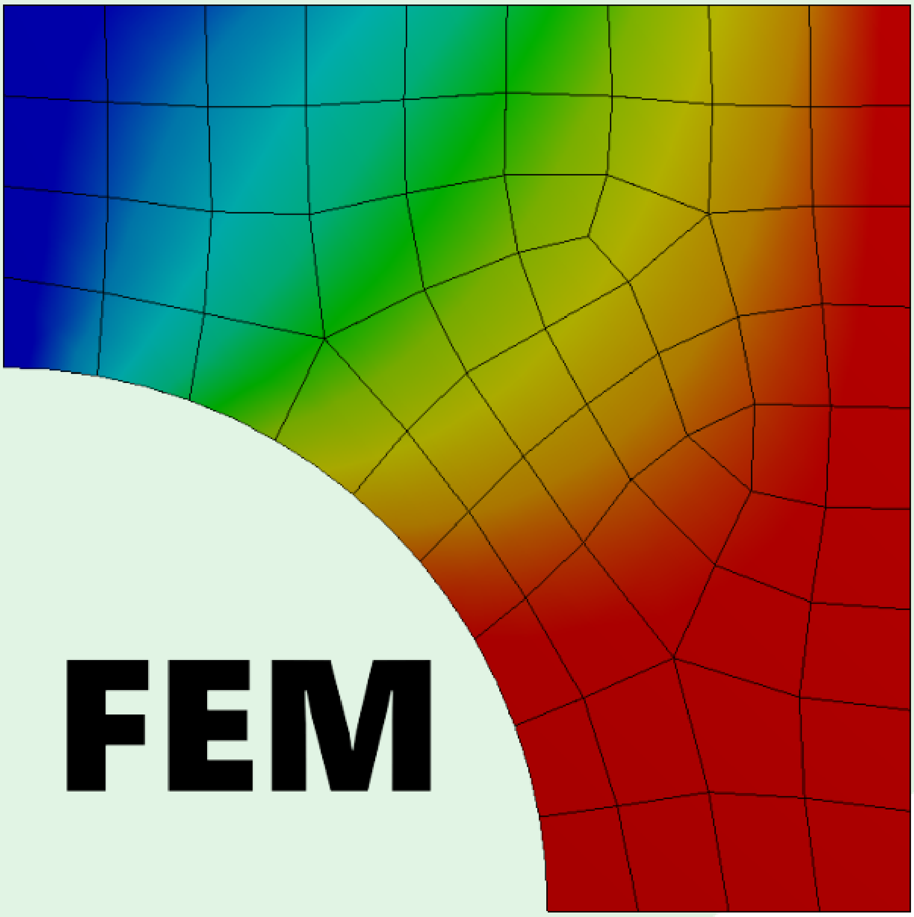
School of Mechanical and Manufacturing Engineering
UNSW Engineering

MMAN4410

Finite Element Methods

Term 3, 2021



Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Garth Pearce	g.pearce@unsw.edu.au	Thursday during term	Ainsworth (J17) 208E	via Teams

Lecturers

Name	Email	Availability	Location	Phone
Gyani Shankar Sharma	gyanishankar.sharma@unsw.edu.au	Thursday during term	Ainsworth (J17) 311E	via Teams

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 will train you to analyse real world structural mechanics problems using the finite element method. You will be introduced to the mathematical basis of finite element analysis, on which nearly all structural analysis software is built. You will learn how to apply commercially available finite element software to solve real-world engineering problems. The course will cater to the specific challenges of engineers across all mechanical engineering sub-disciplines. Any student wishing to extend their structural analysis skills should take this course.

Course Aims

The primary aim of this course is to train you to solve complex engineering structural mechanics problems with finite element analysis. The course will provide deep insight into the operation of finite element analysis software by teaching you the underlying computational methods involved. You will be taught to execute a detailed finite element study including planning, modelling, meshing, solving, evaluating results and validating against real world data.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Apply fundamental finite element analysis techniques to solve simple engineering problems	PE2.1, PE2.2
2. Explain the underlying mathematics behind finite element analysis software solvers	PE1.2, PE3.2
3. Plan and execute appropriate finite element analyses to solve a range of solid mechanics and other engineering problems.	PE2.1, PE2.2, PE2.4, PE3.2
4. Perform a detailed finite element study to investigate a real world engineering problem	PE2.1, PE2.2, PE2.4, PE3.2, PE3.3

Teaching Strategies

The approach to teaching in this class is shaped by a range of formal and informal best-practice approaches. The objective, when at all possible, is for you to experience the concepts in multiple modes (theory, example problems, simulations, demonstrations, etc.). New teaching strategies and teaching technologies are deployed every year to ensure that the course is as up-to-date as possible to leading teaching standards.

This course includes two schedule teaching modes:

1. Lectures to introduce fundamental finite element analysis concepts
2. Software laboratories to apply fundamental concepts in common finite element analysis

packages

In addition to the scheduled teaching, a range of blended material will be used to engage you with independent learning. The major assignment, for example, includes a significant self-guided component which will allow you to study an engineering problem which is specific to your own interests.

Additional Course Information

The following assumed knowledge is expected for postgraduate students undertaking this course: Solid Mechanics (equivalent to UNSW ENGG2400).

This course involves 5 hours per week (h/w) of scheduled contact.

The normal workload expectations of a student are approximately 25 hours per term for each UOC, including class contact hours, other learning activities, preparation and time spent on all assessable work.

You should aim to spend about 11 h/w on this course. The additional time should be spent in making sure that you understand the lecture material, completing the set assignments, further reading, and revising for any examinations.

Assessment

Assessment task	Weight	Due Date	Course Learning Outcomes Assessed
1. Online Quizzes	15%	See description	1, 2
2. Group Assignment (4 per group)	15%	Friday Week 4 (Main Report)	1, 2, 3
3. Major Project	50%	See description	3, 4
4. Final Exam	20%	Exam period	1, 2, 3

Assessment 1: Online Quizzes

Assessment length: 1.5 hours
Submission notes: Moodle Quiz
Due date: See description
Marks returned: Automatically marked, Any uploaded material returned within two weeks

Class lecture material will be assessed through three online quizzes worth 5% each.

For T3 2021, the quiz details are:

- Quiz 1: Wednesday Week 3
    - FE Basics
    - Mathematics of FEM
- Quiz 2: Wednesday Week 5
    - Good FE Practice
    - The Element Library
- Quz 3: Wednesday Week 7
    - Buckling and Nonlinear Analysis

Assessment criteria

Online quiz.

Assessment 2: Group Assignment (4 per group)

Assessment length: 20 Pages max
Due date: Friday Week 4 (Main Report)
Marks returned: Two weeks after submission

A group practical FE assignment. You will collaborate with a group of your peers to design and optimise a simple structure using FEA. There will be an optional opportunity to have you design 3D printed and tested during Flex Week.

Feedback given on this report is intended to assist you in understanding the expectations of the Major Project reports. Detailed task description and submission guidelines will be provided.

Assessment criteria

See rubric below

Additional details

Grading Philosophy

The grading philosophy for this assignment is to use a single rubric to mark the whole assignment (no marking by section or by dot points). Comments will be added anywhere something is done particularly well or where something has been completed incorrectly and needs advice. An overall comment may be attached.

The rubric has been developed to align with the open-ended nature of this assignment. Marks are awarded not for completing prescribed tasks, but for demonstration of achievement through skilled application of FEA. A report that is good, but doesn't excel, will receive a grade between CR and DN.

Each individual will receive a grade that is moderated by a demonstrator. The base report mark with be adjusted up or down according to the quality of your individual section and the demonstrator evaluation of your contributions to group sections.

Rubric

The assignment will be given one overall grade based on the rubric below. If the assignment does not perfectly fit one of the categories, the marker will use their judgement to determine the correct grade.

Fail

Clearly deficient with no results obtained or results are meaningless with no realization or discussion as to why.

Example issues:

- Missing or underreported sections
- Poor presentation
- Fundamental lack of understanding of FEA basics
- Calculations incorrect for extremely clear and easy to fix reasons

Pass

Assignment nominally achieves the stated aims, but with fundamental technical errors, for example:

- Invalid assumptions resulting in poor results that are acknowledged as not useful, but not understood or investigated as to why
- Poor hand calculations
- Poorly planned analysis strategy
- Incorrectly assembled matrices
- Vastly different results between different analysis methods without any clear indication of why the results disagree
- Often has presentation issues (poor formatting, poor use of graphs and tables, etc.)

Credit

This level of report achieves the aims set out in the assignment, but with minor errors. Examples could include:

- Poor presentation of results (e.g. excessive maths, using a table when a graph could be more effective)
- Poor validation strategy
- Inconsistent formatting
- Poorly chosen discretization strategy (i.e. meshing)

Reports at this level often will not have demonstrated the limitations of the assumptions made, whether in the setup (such as your specified boundary conditions) or the FEA (such as different assumptions between your FEA and validation calculations). This prevents effective validation from being achieved.

Distinction

A report that achieves the stated aims with no or minimal errors, but does not attempt anything else. You are encouraged in this course to think outside the box to achieve maximum marks. Distinction level reports are generally correct, but do not excel. Some may include instances of wasted effort such as:

- Validating the commercial FEA results with the FULL structure (simplified analyses can be used to validate your FE analysis methodology)
- Not using symmetry or effective meshing where they are applicable

High Distinction

A technically proficient report which also demonstrated deeper insight than what was mentioned in the lectures (i.e. extended self guided learning). Examples may include:

- Quantitatively investigating the effects of different element types or assumptions (e.g. shell vs solid, boundary condition simplification, etc)
- Using a well planned validation or verification procedure for a simple model
- Investigating their original assumptions and their validity in detail

Full Marks

An outstanding report and extremely well conducted in all aspects that is presented at a professional standard.

- Investigations beyond the scope of what was expected and asked for with a report of professional value and usefulness at the end
- Demonstrates independent research and a comprehensive understanding of FEA basics
- Reports at this level should surprise the marker and leave them thinking “why didn’t I think to do it that way?”

Assessment 3: Major Project

Assessment length: Final Report: 30 pages
Due date: See description
Deadline for absolute fail: 5 days after the respective deadlines

Marks returned: Less than two weeks after the respective deadlines

You will complete a flexible major project which will form the largest component of the assessment for the course. The assessment will be broken into pieces to ensure that adequate progress is being made throughout the term:

1. Mentor/topic selection (0%): Each mentor will supervise one (or a few) projects related to their expertise. **Due Friday Week 2**
2. Project proposal (0%): A detailed summary of what you plan to do to address the topic problem. **Due Sunday after Week 3**
3. Portfolio (10%): A portfolio of work completed towards your project. In addition to the project work, it can (and should) include class examples that have helped you to define your project. **Due Friday Week 8**
4. Peer Evaluation and Reflection (10%): Review the work of others conducting different analyses. Provide constructive feedback and review your own work critically. **Due Friday Week 9**
5. Final Report (30%): The final report of your project. **Due Sunday after Week 10**

Detailed submission guidelines and marking rubrics for each steps will be provided.

Assessment criteria

See rubric below.

Additional details

This is a multi-part assessment with detailed steps and criteria released as part of the course. The final report, the largest section of the project, is graded as follows:

Document Presentation

Judge the overall report presentation. Consider:

- Does the report overall give you a good impression?
- Does the quality of the presentation give you confidence in the quality of the content?
- Does the proposal meet specification (length, etc.)?
- What is the overall quality of English Expression? Is technical jargon correctly used? Is the language clear and concise?
- Is the report correctly sectioned? Do the sections flow correctly and aid the overall argument?
- Are figures presented in a clear way that maximises the communication of information?
- Is the referencing consistent and easy to follow?
- Overall, is the contained information efficiently communicated to the reader?

Context and Aims

Judge how well the major project has been put into context. Consider:

- How well has the *real world* problem been considered? Why is it important and suitable for numerical analysis using FE.
- What background information has been provided to justify that the project is

meaningful/achievable?
- Do you as a reader understand the context of the problem and how solving it makes a valuable contribution to knowledge?

Model Definition

How well has the *real world* problem been converted into a *mathematical problem*? Consider:

- What assumptions/simplifications has the author made in order to reduce the complexity of the problem to a manageable level?
- Are the assumptions reasonable and valid?
- Has the author managed to isolate key aspects of the real world problem so that they can be solved with simple mathematical models?
- Overall, has the author demonstrated an approach which, in your opinion, is simple enough to be solved mathematically yet complex enough to capture important information about the real world problem at hand?

Analysis and Numerical Model

How well has the author converted the *mathematical model* of the problem into a *numerical model*? Consider:

- Choice of analysis methods
- Choice of element type(s) suitable to achieve the desired results
- Choice of boundary conditions, loads, contact, etc.
- Overall, has the author chosen an appropriate discretisation scheme for solving the mathematical model proposed.

Results, Verification and Validation

How well has the author articulated their results and validated them? Consider:

- What results has the author achieved? Are they the correct results to solve the problem they have proposed?
- Are simple problems used to check the results of more complex ones? How valid are the additional simplifications?
- Has the author demonstrated how independent data (experimental or otherwise) corroborates with their results?
- Has the author considered the convergence of their numerical results with reduced element size?

Discussion and Conclusion

What has the author actually learnt about the world by doing conducting the analyses in the report? Consider:

- How well do the results answer the original problem?
- How has the author's own viewpoint been changed by conducting the analysis and how have they influenced your viewpoint as a reader?
- Can the author clearly articulate the value AND limitations of what they have achieved?
- Has the author outlined what the obvious next stage of the analysis would be (i.e. future work)? How achievable is the proposed future work?

Impact

Overall, how does the report resonate with you as an assessor? Consider:

- Does the report as a whole feel complete, concise and valuable?
- Do the results have real-world application? Should this be the start of further study?
- Do you get the impression that the author really understood the task and scoped the project perfectly?

Assessment 4: Final Exam

Assessment length: 2 hours
Due date: Exam period
Deadline for absolute fail: N/A
Marks returned: With course grades

A practical and theoretical computer-based final exam to assess individual competence using finite element analysis to solve simple engineering problems.

Assessment criteria

Exam marking

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: 13 September - 17 September	Lecture	FE Basics: Introduction to FEA; Discretisation; FE Terminology; Stiffness Matrices for Bars and Trusses; Element Library Introduction
Week 2: 20 September - 24 September	Lecture	Mathematics of FEM: Applying Loads and Boundary Conditions; Assembly; Solving for Nodal Displacements; Constitutive Laws; Interpolation of Stress and Strain
	Homework	Major Project - Mentor Selection
Week 3: 27 September - 1 October	Assessment	Quiz 1
	Lecture	Good FE Practice: FE Problem Solving Approach; Assumptions, Mistakes and Errors; Meshing Strategy; Convergence; Validation; Computational Resources; CAD; FE Reporting
	Assessment	Major Project - Project Proposal due
Week 4: 4 October - 8 October	Lecture	The Element Library: 2D Triangles and Quads; Shells; 3D Tets and Hexes; Solid Shells; Isoparametric Elements; Quadratic and Higher Order Elements; Choice of Element Types
	Assessment	Group Assignment due
Week 5: 11 October - 15 October	Assessment	Quiz 2
	Lecture	Buckling and Non-linear Analyses: Eigenvalue Solutions; Linear Buckling; Material Non-linearity; Geometric Non-linearity and Buckling; Iteration Scheme and Incremental Analysis; Contact
Week 6: 18 October - 22 October	Fieldwork	3D printing and testing of your design for the group assignment (optional activity)
Week 7: 25 October - 29 October	Assessment	Quiz 3
	Lecture	Composite Analysis: Basics of Composites and Composite Mechanics; Modelling

		Challenges; General Approaches to Modelling Orthotropic and Layered Materials
Week 8: 1 November - 5 November	Assessment	Major Project Portfolio due
	Lecture	Vibration and Transient Analyses: Modal Analysis; Harmonic Analysis; Other Vibration Solutions; Transient Solutions and their Applications; Choice of Time Discretisation
Week 9: 8 November - 12 November	Assessment	Major Project Peer Review due
	Lecture	Industry Guest Lecture: Challenges of modelling complex real-world problems; Determining what level of simplification is appropriate; What to do with results once you have them; Example projects
Week 10: 15 November - 19 November	Assessment	Major Project Final Report due
	Lecture	Final Exam Preparation: Tackling a past exam paper

Resources

Prescribed Resources

Microsoft Teams and OneNote

Microsoft's communication platform, Microsoft Teams, will be used for most communication in this course. It has native apps for Windows, Android, iOS and more. OneNote will be used to distribute the class notes (embedded in Teams).

myAccess and Matlab

UNSW myAccess provides access to your engineering software from many different devices. This course will use Matlab extensively, which is available through myAccess, the computer labs and https://www.mathworks.com/academia/tah-portal/university-of-new-south-wales-341489.html

Learning Management System

The Moodle LMS, https://moodle.telt.unsw.edu.au/ will also be used for this course

Recommended Resources

UNSW Library

UNSW Library website: https://www.library.unsw.edu.au/

Suggested textbooks

- Madier, D. (2020) Practical Finite Element Analysis for Mechanical Engineers, 1st Ed, FEA Academy. An electronic version of this book is quite reasonably priced and available at https://www.fea-academy.com/index.php/book-store.
- Chandrupatla, T. R., Belegundu, A. D. (2011) Introduction to Finite Elements in Engineering, 4th Ed, Prentice Hall (Pearson)
- Cook, R. D., Malkus, D. S., Plesha, M. E., Witt, R. J. (2002). Concepts and Applications of Finite Element Analysis, 4th Ed, John Wiley & Sons.

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.

In this course, recent improvements resulting from student feedback include:

- Introducing a group assignment to smooth your transition into the course.
- Spreading assessments out over the term more evenly.
- Reducing the assessment load to ensure that you have more time.
- Introducing a build and test lab to physically test your design for the group assignment.

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

****T3-2021 UPDATE****
Classes will be entirely ONLINE until at least Week 6, after which we will receive further advice from UNSW about the return of face-to-face classes. Students who are enrolled in face-to-face classes will have access to the course's online content but NO classes will be changed to reflect online delivery until Week 6 due to uncertainty regarding delivery mode for the rest of the term. Please go to your course's Moodle modules and MS Teams sites for further information about accessing course resources and content.

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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 polices. In particular, students should be familiar with the following:

- Attendance
- UNSW Email Address
- Special Consideration
- Exams
- Approved Calculators
- Academic Honesty and Plagiarism

Image Credit

Garth Pearce

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	