MMAN2300

Engineering Mechanics 2

Term Two // 2021

School of Mechanical and Manufacturing Engineering // UNSW Engineering

Course Overview

Staff Contact Details

Convenors

Name	Email	Availability	Location	Phone
Zhongxiao Peng	mman2300@unsw.edu.au		J18-408B	02 93854142

Lecturers

Name	Email	Availability	Location	Phone
Pietro Borghesani	mman2300@unsw.edu.au		J17-408H	02 93857899

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

This course covers the practical application of engineering mechanics and mechanical vibrations. Topics include the following: Plane kinematics and kinetics of rigid bodies; equations of motion, work and energy; Introduction to mechanical vibration; Free and forced responses of single degree-of-freedom spring-mass-damper systems, vibration isolation; Harmonic analysis; Linear vibrations of multi-degree-of-freedom systems.

Course Aims

This course aims to develop your understanding of the mechanics of planar rigid bodies, mechanisms, and vibratory systems.

Course Learning Outcomes

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

Learning Outcome	EA Stage 1 Competencies
1. Explain, describe and apply principles and components of Engineering Mechanics using a range of techniques	PE1.1, PE1.2, PE2.1, PE3.2
2. Explain and describe principles and components of mechanical vibrations	PE1.1, PE1.2, PE2.1, PE3.2
3. Discern the relevant principles that must be applied to describe the equilibrium or motion of engineering systems and discriminate between relevant and irrelevant information in the context	PE1.1, PE1.2, PE2.1
4. Demonstrate an ability to communicate clearly and precisely about technical matters related to Engineering Mechanics	PE1.6, PE3.2
5. Accomplish hands on tasks that require the application of knowledge of Engineering Mechanics	PE2.1, PE2.2

Teaching Strategies

This course involves six hours (four hours of lecture and two hours of workshops/problem solving sessions) per week of face to face and/or online contact. It is expected that students will put in, at least, an additional four hours per week of their own time. This time should be spent in revising the lecture material and further reading, completing the weekly homework problems, and revising and learning for the quizzes and examinations.

The teaching strategies that will be used include:

- Presentation of the material (derivations and examples) in lectures
- Workshops/problem solving sessions with demonstrators to help students to understand and solve problems
- An assessment structure which includes two quizzes in the term and weekly homework problems, in order to encourage students to keep up to date with the content
- Laboratory experiments (face to face and/or through virtual labs) to understand important concepts covered in the course.

Assessment

Assessment Tasks

Assessment task	Weight	Due Date	Student Learning Outcomes Assessed
Weekly Homework Problems	16%	Dates specified in description	1, 2, 3, 5
Moodle Quizzes	14%	Dates specified in description	1, 2, 3, 5
Laboratory Class Assignments	30%	Dates specified in description	1, 2, 3, 4, 5
Final Exam	40%	Not Applicable	1, 2, 3, 4, 5

Assessment Details

Assessment 1: Weekly Homework Problems

Start date: To be communicated

Length: 1 hour/week

Details:

This is an individual assessment.
Students will be given questions to solve and need to submit their handwritten working in PDF. Problem sets are due at 1:00 PM (Sydney time) each Wednesday in weeks 2-5 and 7-10, for a total of 8 submissions throughout the term. Each homework problem set is worth 2% (2 marks), for a total of 16% of all eight problem sets.
The full mark (2 marks) of each week's homework submission is awarded if all questions for the week are attempted and reasonable effort to solve the entire problem set is demonstrated. One (1) mark out of 2 will be given when at least half of the weekly questions are attempted and a reasonable amount of effort for their solution is shown. A zero (0) mark is given if less than half of the weekly work is submitted or if the attempts show no or little effort for solving the problems.
Students must submit handwritten (not typed) working (in PDF) of weekly homework problems. Handwriting in digital-ink is accepted.
Standard late-submission policy applies to this assessment item. The deadline for absolute fail for each homework set is 5 days after the corresponding due date.
Further details (including changes, if any) on the submission process will be provided during the term.
On-time submissions will be marked and returned within 1 week of the corresponding due date.

Assessment 2: Moodle Quizzes

Start date: Dates specified in description

Length: to be communicated

Details:

This is an individual assessment.
Two quizzes (weight: 7% each) to be submitted on Moodle.
Moodle quiz 1 (Part A Dynamics) is scheduled at 6pm-7pm (Sydney time), Wednesday in week 3 (16 June 2021). This quiz will include the content covered in weeks 1-2.
Moodle quiz 2 (Part B Vibration) is scheduled at 6pm-7pm (Sydney time), Wednesday in week 8 (21 July 2021). This quiz will include the content covered in weeks 5-7, plus any content from the dynamics part (weeks 1-5) relevant to vibration.
Students will be required to submit both:

- their handwritten working (PDF upload)
- their final answers (directly in the Moodle quiz)

No late submission is allowed for this assessment. Zero (0) marks will be awarded for late submissions.
Further details on submission will be provided during the course.
Submissions will be marked and returned within 2 weeks.

Assessment 3: Laboratory Class Assignments

Start date: To be communicated

Length: See description on Moodle

Details:

Two (2) Laboratory Assignments/Reports (weight 15% each) based on virtual/face-to-face laboratories, see assignment/report description on Moodle.
Due date for report #1 (dynamics): Friday 16 July, 5pm (Sydney time)
Due date for report #2 (vibration): Friday 6 August, 5pm (Sydney time)
The standard late-submission policy applies for this assessment item. The deadline for absolute fail for each lab assignment is 5 days after the corresponding due date.
Further details on submission will be provided during the term. On-time submissions will be marked and returned within 2 weeks of the corresponding due date.

Assessment 4: Final Exam

Start date: Refer to Examination timetable in myUNSW

Details:

Formal examination at the end of the term. The exam will include all topics covered in both parts (Dynamics and Vibration) of the course.

The exam will be conducted online (Moodle). No late submission is allowed for this assessment. Late submissions will not be accepted and will receive a zero (0) mark.
Further details will be provided before the exam.

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: 31 May - 4 June	Lecture	Monday 31 May: 1st Lecture in the week Course Outline Part A: Rigid Body Dynamics Velocity analysis (review)
	Lecture	Tuesday 1 June: 2nd Lecture in the week Part A: Rigid Body Dynamics Velocity analysis of rigid bodies to rotating axes
	Workshop	Monday 31 May - Tuesday 1 June: 1st Problem Solving Session in the week Part A: Rigid Body Dynamics Velocity analysis (review)
	Workshop	Thursday 3 June - Friday 4 June: 2nd Problem Solving Session in the week Part A: Rigid Body Dynamics Velocity analysis of rigid bodies to rotating axes
Week 2: 7 June - 11 June	Lecture	Monday 7 June: 1st Lecture in the week Part A: Rigid Body Dynamics Instantaneous centre of zero velocity
	Lecture	Tuesday 8 June: 2nd Lecture in the week Part A: Rigid Body Dynamics Acceleration analysis (review)
	Workshop	Monday 7 June - Tuesday 8 June: 1st Problem Solving Session in the week Part A: Rigid Body Dynamics Instantaneous centre of zero velocity
	Workshop	Thursday 10 June - Friday 11 June: 2nd Problem Solving Session in the week Part A: Rigid Body Dynamics Acceleration analysis (review)
Week 3: 14 June - 18 June	Lecture	Tuesday 15 June: Lecture in the week* Part A: Rigid Body Dynamics Acceleration analysis - "Coriolis type" problems *Monday is a public holiday and therefore there is no class.
	Workshop	Tuesday 15 June:1st Problem Solving Session in the week* Part A: Rigid Body Dynamics

		Acceleration analysis - "Coriolis type" problems *Monday is a public holiday and therefore there is no workshop. Students enrolled in Monday's workshops can join any online Tuesday session or watch the video.
	Workshop	Thursday 17 June - Friday 18 June: 2nd Problem Solving Session in the week Part A: Rigid Body Dynamics Acceleration analysis - "Coriolis type" problems
	Assessment	Wednesday 16 June Moodle Quiz 1: Topics covered in weeks 1 and 2
Week 4: 21 June - 25 June	Lecture	Monday 21 June: 1st Lecture in the week Part A: Rigid Body Dynamics Kinetics of rigid bodies 1
	Lecture	Tuesday 22 June: 2nd Lecture in the week Part A: Rigid Body Dynamics Kinetics of rigid bodies 2
	Workshop	Monday 21 June - Tuesday 22 June: 1st Problem Solving Session in the week Part A: Rigid Body Dynamics Kinetics of rigid bodies 1
	Workshop	Thursday 24 June - Friday 25 June: 2nd Problem Solving Session in the week Part A: Rigid Body Dynamics Kinetics of rigid bodies 2
Week 5: 28 June - 2 July	Lecture	Monday 28 June: 1st Lecture in the week Part A: Rigid Body Dynamics Mechanisms and summary
	Lecture	Tuesday 29 June: 2nd lecture in the week Part B: Vibration Analysis Free SDOF vibration modelling
	Workshop	Monday 28 June - Tuesday 29 June: 1st Problem Solving Session in the week Part A: Rigid Body Dynamics Mechanisms
	Workshop	Thursday 1 July - Friday 2 July: 2nd Problem Solving Session in the week Part B: Vibration Analysis Free SDOF vibration modelling
	Blended	Lab 1: Coriolis Effect Further information on the lab activity will be provided on Moodle.
Week 7: 12 July - 16 July	Lecture	Monday 12 July: 1st Lecture in the week Part B: Vibration Analysis Free SDOF vibration solution and analysis
	Lecture	Tuesday 13 July: 2nd Lecture in the week Part B: Vibration Analysis Forced SDOF vibration

	Workshop	Monday 12 July - Tuesday 13 July: 1st Problem Solving Session in the week Part B: Vibration Analysis Free SDOF vibration solution and analysis
	Workshop	Thursday 15 July - Friday 16 July: 2nd Problem Solving Session in the week Part B: Vibration Analysis Forced SDOF vibration
Week 8: 19 July - 23 July	Lecture	Monday 19 July: 1st Lecture in the week Part B: Vibration Analysis Forced SDOF vibration - Special cases and applications
	Lecture	Tuesday 20 July: 2nd Lecture in the week Part B: Vibration Analysis Summary of SDOF vibration
	Workshop	Monday 19 July - Tuesday 20 July: 1st Problem Solving Session in the week Part B: Vibration Analysis Forced SDOF vibration - Special cases and applications
	Workshop	Thursday 22 July - Friday 23 July: 2nd Problem Solving Session in the week Part B: Vibration Analysis Summary of SDOF vibration
	Blended	Lab 2: Vibration analysis Further information on the lab activity will be provided on Moodle.
	Assessment	Wednesday 21 July Moodle Quiz 2: Topics covered in weeks 5 and 7 plus any content from the dynamics part (weeks 1-5) relevant to vibration
Week 9: 26 July - 30 July	Lecture	Monday 26 July: 1st Lecture in the week Part B: Vibration Analysis 2DOF free vibration
	Lecture	Tuesday 27 July: 2nd Lecture in the week Part B: Vibration Analysis 2DOF forced vibration
	Workshop	Monday 26 July - Tuesday 27 July: 1st Problem Solving Session in the week Part B: Vibration Analysis 2DOF free vibration
	Workshop	Thursday 29 July - Friady 30 July: 2nd Problem Solving Session in the week Part B: Vibration Analysis 2DOF forced vibration
Week 10: 2 August - 6 August	Lecture	Monday 2 August: 1st Lecture in the week Part B: Vibration Analysis Summary of 2DOF vibration and introduction to continuous systems

	Lecture	Tuesday 3 August: 2nd Lecture in the week Parts A&B: Practice review
	Workshop	Monday 2 August - Tuesday 3 August: 1st Problem Solving Session in the week Part B: Vibration Analysis Vibration recap exercises
	Workshop	Thursday 5 August - Friday 6 August: 2nd Problem Solving Session in the week Parts A&B: Practice review

Resources

Prescribed Resources

Meriam, J.L., Kraige, L.G. and J.N. Bolton, *Engineering Mechanics - Dynamics*, SI Version, 9th ed., Wiley

Recommended Resources

Rao, S.S. *Mechanical Vibrations*, SI Edition, Pearson Prentice Hall

Waldron, K.J. and Kinzel, G.L. *Kinematics, Dynamics, and Design of Machinery*, 2nd ed., Wiley

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 changes to the assessment items to spread workload and encourage students to keep up-to-date with the content.

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 polices. 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	