UNSW SYDNEY | Australia's Global University

Mechanical and Manufacturing Engineering

Course Outline

Semester 2 2017

MMAN1300

ENGINEERING MECHANICS 1

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1. Staff contact details

Contact details and consultation times for course convenor

Name: Dr. David C. Kellermann
Office location: Ainsworth 507
Tel: (02) 9385 4390
Email: d.kellermann@unsw.edu.au
Moodle: https://moodle.telt.unsw.edu.au/login/index.php

Contact details for Head Demonstrator

Name: Dr. Muhammad Danish Haneef
Office location: Ainsworth 408, Desk
Email: m.haneef@unsw.edu.au

Queries and consultation

For queries and consultation, proceed in the following order:

1) Ask your peers
2) Ask your demonstrators
3) Post to the Moodle forum
4) Email the head demonstrator
5) Email your lecturer
6) Arrange for a consultation time with your lecturer

If you email your head demonstrator or lecturer, please include all information in the email, for example, rather than saying "in Question 5 of the problem set", take a screenshot or photo of Question 5 so we can answer your question on the spot.

Contact details and consultation times for additional demonstrators:

Name	**Contact email address**
Muhammad Danish Haneef	m.haneef@unsw.edu.au
Ellington Steanes	steanes.ellington@gmail.com
Jonathan Dufty	jon.dufty95@gmail.com
Matthew Eyles	mattheweyles51@gmail.com
Ehsan Khaled	ehsankhaled87@gmail.com
Alireza (Alex) Moridi Farimani	moridi@msn.com
Briscoe Kerferd	briscoe.kerferd@gmail.com
Llanthony Xin-Williams	lxw029512@gmail.com
Harshad Ranadive	h.ranadive@unsw.edu.au
Joe Sun	jjaysun92@gmail.com
Harrison Low	harrison.a.low@gmail.com
Michael Ling	m.z.ling@unsw.edu.au

2. Important links

- Moodle
- UNSW Mechanical and Manufacturing Engineering
- Course Outlines
- Student intranet
- UNSW Mechanical and Manufacturing Engineering Facebook
- UNSW Handbook

3. Course details

Credit Points

This is a 6 unit-of-credit (UoC) course, and involves 5 hours per week of face-to-face contact.

The UNSW website states "The normal workload expectations of a student are approximately 25 hours per semester for each UoC, including class contact hours, other learning activities, preparation and time spent on all assessable work. Thus, for a full-time enrolled student, the normal workload, averaged across the 16 weeks of teaching, study and examination periods, is about 37.5 hours per week."

This means that you should aim to spend about 9 hours per week 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.

Contact hours

	Day	**Time**	**Location / Live stream**
Lecture	Monday	9:00am - 11:00am	Ainsworth G03 and Moodle
	Tuesday	1:00pm - 2:00pm	Ainsworth G03 and Moodle
Problem Solving Session (PSS) Wks 1-13	Friday	9:00am - 11:00am	Ainsworth G01
			Red Centre West M010
			Ainsworth 201
			Ainsworth 101
		11:00am - 1:00pm	Ainsworth 201
			Ainsworth 101
			Ainsworth G01
		1:00pm - 3:00pm	Ainsworth G01
			Ainsworth 201
			Ainsworth 101
Block Tests Wks 4,7,10,13	Friday	6:00pm - 7:00pm	Central Lecture Block 7

Please refer to your class timetable for the learning activities you are enrolled in and attend only those classes.

Summary and Aims of the course

This is your first course in Engineering Mechanics, which is the study of the interaction of matter and forces in engineering contexts. It is evident that all objects in the world around us are composed of matter, and they are all subject to forces. As such, Engineering Mechanics is the foundational tool for engineers, and forms the underlying basis for understanding more advanced fields such as Solid Mechanics, Fluid Dynamics, Rigid Body Dynamics, Aerodynamics, Structures, Control and many aspects of Advanced Design.

For many of you, this course is a direct pre-cursor to two Year 2 courses: MMAN2400 Mechanics of Solids 1 and MMAN2300 Engineering Mechanics 2.

The aim of this course can be stated simply: For everyone involved (staff, students, demonstrators) to progress further towards becoming really good engineers.

Our field of endeavour will be the concepts and applications of Introductory Engineering Mechanics. Additionally, we will not measure our progress as the number of equations or facts or theories that we know. Rather, as our degree of transformation into someone who sees, understands, can make relevant and accurate predictions, and communicates about the world around us through the lens of Engineering Mechanics.

Student learning outcomes

This course is designed to address the learning outcomes below and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

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. Principles and components include: vectors, forces, torques, mass and inertia, particles and rigid bodies in two dimensions, equilibrium conditions, linear momentum and impact, kinetic and potential energy and internal forces and bending moments in beams.	1.1, 1.2, 2.1, 3.2
2.	Define engineering systems in a mechanically useful way and describe their equilibrium or motion in mathematical and graphical fashion and be able to relate this description to the principles of engineering mechanics.	1.1, 1.2, 2.1, 2.2, 3.2
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.	1.1, 1.2, 2.1

4.	Demonstrate an ability to communicate clearly and precisely about technical matters related to Engineering Mechanics.	1.6, 3.2
5.	Accomplish hands on tasks that require the application of knowledge of Engineering Mechanics.	2.1, 2.2

4. Teaching strategies

This course will be delivered both in the classroom and online. Full participation in the class means that you will participate fully in both arenas. That is, you will be held accountable for all content, instructions, information, etc. that is delivered either in class or online. There will also be laboratory or practical exercises that you may have to complete during your self-study time.

Online: The online forum for participation in this class is the Moodle Platform. All official online interactions will take place or be linked clearly and appropriately from this site.

In class: There are three in-class activities in a typical week, which we refer to as the Monday Lecture, Tuesday Lecture and Problem Solving Session based on the timetable above.

Both the online and in-class segments of this course are organised on the following principles:

1. **Learning:** Student learning is the first priority - teaching and assessment are secondary concerns. Learning here is defined as gaining new ways of seeing the world, not as being filled with information. We are trying to transform you into engineers and critical thinkers in the discipline.
2. **Peer Interaction:** Learning is a social activity, and research shows that you will learn most and best when you are actively taught by your peers and, in turn, when you teach them.
3. **Authenticity:** We will have as much authenticity of engineering practice as is possible within the constraints of the course and where it does not restrain your learning.
4. **High standards:** We will have high standards for achievement in the course, and everyone (including staff) will be accountable for putting in the effort to get you to the standard.
5. **Openness:** As much of the course as possible will be conducted in the open where all participants can be aware of it and comment upon it.
6. **Process:** The focus of the course will be on processes, not outcomes. The right outcomes will be a by-product of following the correct processes.

5. Course schedule

	Week	Topic	Quiz	Assignment, Lab work or Block Test	Suggested Readings
Block 1	1	Introduction to statics; vectors; units; force systems, moments and couples	Quiz 1		M&K(S) Ch1-2
	2	Equilibrium; free body diagrams; Equations of Equilibrium	Quiz 2		M&K(S) Ch3
	3	Structures; Trusses: method of joints and method of sections; supports	Quiz 3	Truss assignment given	M&K(S) Ch4/1-5
Block 2	4	Frames and Machines; Distributed forces; centroids and mass centres;	Quiz 4	**Block Test 1**	M&K(S) Ch4/6-5/5
	5	Beams; internal and external effects; shear force and bending moment diagrams	Quiz 5	Shear Force and Bending Moment Experiment	M&K(S) Ch5/6-10
	6	Friction; static and dynamic coefficients; wedges, screws, bearings	Quiz 6	Truss assignment due	M&K(S) Ch6
Block 3	7	Newton's Laws; gravity; particle kinematics; rectilinear motion; curvilinear motion	Quiz 7	**Block Test 2**	M&K(D) Ch1-2/3
	8	Particle kinematics for normal/tangential and polar coordinates; particle kinetics	Quiz 8	Shear Force and Bending Moment Report Due	M&K(D) Ch2/4-3/5
	9	Work, kinetic energy; potential energy; Linear/ angular Impulse and momentum	Quiz 9	Rolling Disc Laboratory Experiment	M&K(D) Ch3/6-15
Block 4	10	Labour Day; Kinetics of particle systems; conservation of energy and momentum	Quiz 10	**Block Test 3**	M&K(D) Ch4
	11	Plane kinematics of rigid bodies; relative velocity; instantaneous centres	Quiz 11		M&K(D) Ch5
	12	Plane kinetics of rigid bodies; work-energy method	Quiz 12	Rolling Disc Laboratory Report Due	M&K(D) Ch6
	13	Optional revision lecture; Study resources		**Block Test 4**	

6. Assessment

Assessment overview

Assessment task	Length	Weight	Learning outcomes assessed	Assessment criteria	Due date, time	Deadline for absolute fail	Marks returned
4 x Block Tests	45 mins each	24% (6 marks each)	1, 2, 3, 4	Demonstrating ability under exam conditions	Friday 6-7pm in weeks 4, 7, 10 and 13.	N/A	Within 2 weeks after each test
12 x Weekly PSS and Moodle quiz	Weekly	24% (1+1 marks each week)	1, 2, 3, 4	Weekly problem solving attempts, continued learning.	PSS: WK X+1 Quiz: 5pm Tuesday after, weeks 2-13	PSS: WK X+2 Quiz: No late submissions	Same day
2 x Individual Laboratory Reports + 1 assignment	10 pages max	12% (4 marks each)	1, 3, 4, 5	Correctness, completeness, professionalism of report	5pm Friday, weeks 6, 8, 12.	5pm the Monday after	Within 2 weeks after the due date
Final exam	2 hours	40%	1, 2, 3, 4	Understanding of all course content	Exam period, date TBA.	N/A	Upon release of final results

Assessment Criteria

PSS Hand-ins:

- Students will get 1 mark for each week that they show their demonstrators a complete and reasonable attempt at all hand in questions
- An incomplete set of solutions or unreasonable attempt will score 0.5 marks
- If a student comes late to the PSS or leaves late, their demonstrator will only give them 0.5
- If the student brings the PSS Hand-in a week late, they will receive a maximum of 0.5 marks
- Zero marks will be awarded for work more than one week late

Block Tests:

- Use the basic concepts such as Free-Body Diagrams (FBD) and Equations of Equilibrium (EoE)
- Systematic approach to outline the steps for a problem and use the necessary fundamental concepts covered in the lectures and problem solving sessions
- Correctness of the solution with the aid of necessary diagrams/sketches and the use of appropriate units
- There are no supplementary block tests. If you miss the block test, you must apply for Special Considerations through the University
- All special considerations lodged more than 48 hours after the test date will be rejected without exception
- If Special Considerations are granted, the student will be given a calculated mark that is 80% of the mark calculated based on their performance in the other three block tests. For example, if you score 100% in the three block tests you attend, you would be given 80% for the Block Test you missed

Laboratory Reports:

- Interpretation of the experimental results for the required information described in the hand out for each experiment
- Understanding the relationship between the theory covered during the lectures to experimental results in the laboratory
- Presentation of report in accordance with the MECHENG guidelines
- Attendance and participation during the laboratory experiments
- It is the student's responsibility to ensure the mark in the Moodle Gradebook is correct, and must be checked within one week of release

Final examination:

- Use the basic concepts such as Free-Body Diagrams (FBD) and Equations of Equilibrium (EoE)
- Systematic approach to outline the steps for a problem and use the necessary fundamental concepts covered in the lectures and problem solving sessions
- Correctness of the solution with the aid of necessary diagrams/sketches and the use of appropriate units
- A pass in this course requires a mark of 50% in the final examination and overall

Assignments

Presentation

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.

Submission

Late submissions will be penalised up to 5 marks per calendar day (including weekends). An extension may only be granted in exceptional circumstances. Special consideration for assessment tasks must be processed through student.unsw.edu.au/special-consideration.

It is always worth submitting late assessment tasks when possible. Completion of the work, even late, may be taken into account in cases of special consideration.

Where there is no special consideration granted, the 'deadline for absolute fail' in the table above indicates the time after which a submitted assignment will not be marked, and will achieve a score of zero for the purpose of determining overall grade in the course.

Marking

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.

Examinations

You must pass the final exam in order to pass the course.

Inability to attend the block tests on one of these times for reasons such as work commitments, holidays etc. cannot, unfortunately, be accommodated with a class of this size. Of course, arrangements will be made for emergencies such as illness. Arrangements for each type of assessment are tabulated below.

Type of Assessment	
Block tests 1-4	No supplementary
Weekly assessment	PSS one week late, 0.5 marks and Moodle, no late submissions
Laboratory	Reports submission via Moodle
Final Examination	Standard UNSW special considerations for supplementary

You must be available for all tests and examinations. Final examinations for each course are held during the University examination periods, which are June for Semester 1 and November for Semester 2.

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

Calculators

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an "Approved" sticker for it from the School Office or the Engineering Student Centre prior to the examination. Calculators not bearing an "Approved" sticker will not be allowed into the examination room.

Special consideration and supplementary assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see the School intranet, and the information on UNSW's Special Consideration page.

7. Attendance

You are required by UNSW Policy to attend a minimum of 80% of all classes, including lectures, labs and seminars. It is possible to fail the course if your total absences equal to more than 20% of the required attendance by UNSW Policy. Please see the School intranet and the UNSW attendance page for more information.

For MMAN1300 we will be enforcing a minimum of 50% attendance, which means that you must attend at least 50% of the lectures, (or watch at least 50% of online recordings if you are enrolled as a web student) or you will be given a fail grade. We will be working on technologies for recording this throughout semester.

8. Expected resources for students

Essential textbooks (available through the UNSW bookshop)

Meriam J.L., Kraige L.G. Engineering Mechanics:
Vol. 1 – Statics, 7th Edition, SI Version. Wiley. (referred to as M&K(S))
Vol. 2 – Dynamics, 7th Edition, SI Version. Wiley. (referred to as M&K(D))

Students are strongly recommended to purchase both these textbooks as they will be used both in this course and in later mechanics courses.

Moodle site for MMAN1300, access via: http://moodle.telt.unsw.edu.au/my/

School's website: http://www.engineering.unsw.edu.au/mechanical-engineering/

Other Resources

If you wish to explore any of the lecture topics in more depth, then other resources are available and assistance may be obtained from the UNSW Library: https://www.library.unsw.edu.au/

9. 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 a restructuring of the course syllabus to more simply follow the order of topics in the prescribed text. Furthermore, a wide number of highly successful technologies introduced in Semester 1 have been brought to this course for the first time. The loading of labs and assessments has been better spread out.

10. 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: 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

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

11. Administrative matters and links

All students are expected to read and be familiar with School guidelines and polices, available on the intranet. In particular, students should be familiar with the following:

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

Appendix A: Engineers Australia (EA) Competencies

Stage 1 Competencies for Professional Engineers

	Program Intended Learning Outcomes
PE1: Knowledge and Skill Base	PE1.1 Comprehensive, theory-based understanding of underpinning fundamentals
	PE1.2 Conceptual understanding of underpinning maths, analysis, statistics, computing
	PE1.3 In-depth understanding of specialist bodies of knowledge
	PE1.4 Discernment of knowledge development and research directions
	PE1.5 Knowledge of engineering design practice
	PE1.6 Understanding of scope, principles, norms, accountabilities of sustainable engineering practice
PE2: Engineering Application Ability	PE2.1 Application of established engineering methods to complex 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
PE3: Professional and Personal Attributes	PE3.1 Ethical conduct and professional accountability
	PE3.2 Effective oral and written communication (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