UNSW AUSTRALIA

Course Outline

Semester 1 2015

Never Stand Still | Faculty of Engineering | School of Mechanical and Manufacturing Engineering

MMAN1300
Engineering Mechanics 1

Contents

1. COURSE AT A GLANCE

Week	Statics Content M&K Statics	Dynamics Content M&K Dynamics	Assessed Activities
	Shared Content MK(S) or MK(D)		
1	**Introduction** MK(S)1/1 **Newton's Laws** MK(S)1/4, MK(D)1/3 **Fundamental Concepts** MK(S)1/2, MK(D)1/2 **Vectors** MK(S)C/7, MK(D)C/7 **Dimensions** MK(S)1/5, MK(D)1/4 **Forces** MK(S) 2/2,3,7 **Moments** MK(S)2/4,5,8		
2	**Free Body Diagrams** MK(S)3/2		• Moodle Quiz • Problem Solving Exercise
	Equilibrium 3/3,4		
3	**Equivalent loads** 2/6,9 **Determinacy** 3/3,4 **Trusses** 4/2-4	**1-D Kinematics** 2/2	• Adaptive eLearning: FBDs • Test 1
4		**2-D Kinematics** 2/3,4 **Projectile Motion** 2/4 **Relative Motion** 2/8 **Circular Motion** 2/5-6 **Constraints** 2/9	• Adaptive eLearning: Trusses • Problem Solving Exercise
	Coordinate Systems MK(S)2/4-6		
5		**Intro to Kinetics** 3/1 **Particle Dynamics** 3/2-5	• Group Assignment: Trusses • Moodle Quiz
	Friction MK(S)6/1-5		
	No lecture or problem solving sessions on Friday - public holiday		
6	**Machines & Frames** 4/6		• Adaptive eLearning: Projectile Motion • Adaptive eLearning: Friction • Problem Solving Exercise • Peer Assessment of Group Assignment
	Distributed Forces MK(S) 5/1 **Centroids, Centre of Mass, Centre of Gravity** MK(S)5/2-5/4 **Distributed Force Applications** MK(S) 5/6,9		
7	**Internal Loads in Beams: Shear Force and Bending Moment at a Section** 5/7		• Adaptive eLearning: Centroids • Problem Solving Exercise
8		**Impulse & Momentum** 3/8-10 **Impact** 3/12 **Work, Energy & Power** 3/6-7	• Adaptive eLearning: Impulse & Momentum • Test 2
9		**Rigid Body Kinematics** 5/1-6	• Adaptive eLearning: Work & Energy • Moodle Quiz • Problem Solving Exercise
10		**Rigid Body Translation** 6/1-3 **Mass Moments of Inertia** B/1 **Fixed-axis rotation** 6/4	• Adaptive eLearning: Shear Force & Bending Moment • Problem Solving Exercise • Laboratory report: Shear Force & Bending Moment
11		**Rigid Body Work & Energy** 6/6 **Intro to General Motion of Rigid Bodies** 6/5	• Problem Solving Exercise • Moodle Quiz
12	**Revision**		• Test 3
13	**No lecture content**		• Problem Solving Exercise

2. COURSE STAFF

Contact details and consultation times for course convener

Dr Mark Whitty
Room 305, Tyree Energy Technologies Building (H6)
Tel (02) 9385 4230
Email m.whitty@unsw.edu.au

Consultation concerning this course should in the first instance be made with your demonstrators, then using the Moodle discussion forums and as a last resort by email to the course lecturers.

Contact details and consultation times for additional lecturers and tutorial/laboratory teaching staff

Dr Nathan Kinkaid
Room 414, Electrical Engineering Building (G17)
Tel (02) 9385 4180
Email n.kinkaid@unsw.edu.au

3. COURSE DETAILS

Units of credit

Units of credit: Six (6).
For MMAN1300 (6UoC) this means roughly:

In class	5 hours per week
Self-study	6 hours per week
Total	11 hours per week

Weekly Schedule

Lecture: Wednesday 1400-1600 **Room**: Blockhouse 204
Friday 1400-1500 **Room**: Old Main Building (OMB) 145

Problem Solving Class: Friday 1500-1700 **Rooms:** Blockhouse 205 and Webster 256

There is no parallel teaching in this course.

Aims of the course

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.

Context

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 Solid Mechanics 1 and MMAN2300 Engineering Mechanics 2.

Expected student learning outcomes

Students who successfully complete this course will be able to:	**UNSW graduate attributes**[1]
1. Explain and describe principles and components of Engineering Mechanics and their inter-relationships formally and informally, in writing and verbally, to technical experts, peers and lay people. Such principles and components include: vectors, forces, torques, mass and inertia, particles and rigid bodies, equilibrium conditions, free and constrained motion of particles and rigid bodies in two dimensions, balance of linear momentum, balance of angular momentum, mechanical work, kinetic and potential energy, mechanical power, and internal forces and bending moments in beams.	1.1, 1.3, 1.6

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. Engineering systems here may be as presented in a textbook or laboratory, or as observed in the everyday world around us.	1.4, 4.1
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.	1.2, 1.3, 1.4
4. Demonstrate an ability to communicate clearly and precisely about technical matters related to Engineering Mechanics. Such communication will be verbal, in writing, and in digital media such as videos, audio recordings, and web postings. Additionally, students will be able to demonstrate this ability in jargon-free language as is appropriate for lay persons as well as in technical terms for an intended audience of peers and practicing engineers.	1.6, 1.7, 1.8
5. Work in formal and informal groups to accomplish tasks that require the application of knowledge of Engineering Mechanics.	1.2, 2.3

[1]UNSW's graduate attributes are shown at
https://my.unsw.edu.au/student/atoz/GraduateAttributes.html

UNSW graduates will be

1. Scholars who are:
   1.1. understanding of their discipline in its interdisciplinary context
   1.2. capable of independent and collaborative enquiry
   1.3. rigorous in their analysis, critique, and reflection
   1.4. able to apply their knowledge and skills to solving problems
   1.5. ethical practitioners
   1.6. capable of effective communication
   1.7. information literate
   1.8. digitally literate

2. Leaders who are:
   2.1. enterprising, innovative and creative
   2.2. capable of initiating as well as embracing change
   2.3. collaborative team workers

3. Professionals who are:
   3.1. capable of independent, self-directed practice
   3.2. capable of lifelong learning
   3.3. capable of operating within an agreed Code of Practice

4. Global Citizens who are:
   4.1. capable of applying their discipline in local, national and international contexts
   4.2. culturally aware and capable of respecting diversity and acting in socially just/responsible ways
   4.3. capable of environmental responsibility

You are also encouraged to compare the learning outcomes with the Engineers Australia Stage 1 Competencies for Professional Engineers. Engineers Australia is the accrediting body for engineering education in Australia, and as such it is necessary that you are able to demonstrate these competencies by the time of your graduation in Engineering.

The Stage 1 Competencies can be found at:
http://www.engineersaustralia.org.au/sites/default/files/shado/Education/Program%20Accreditation/110318%20Stage%201%20Professional%20Engineer.pdf

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, specifically the Engineering Mechanics 1 course at http://moodle.telt.unsw.edu.au/course/view.php?id=13587. 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 Wednesday Lecture, Friday Lecture and Problem Solving Class 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. ASSESSMENT

As much as is practicable, assessment in the course will be used to see if students have gained new ways of seeing, not to differentiate them from each other or to sort them. This is naturally limited by University rules concerning the grading of students and students desire to understand where they stand in relation to their peers. Further details of individual assessment tasks will be provided on Moodle, including submission procedures and the criteria by which grades will be assigned.

Late Submission Policy

Late submission of Problem Solving Exercises (PSEs), Moodle Quizzes, Adaptive eLearning Tutorials, the Group Assignment and the Laboratory Report is **not** permitted in this course. Special consideration may be granted according to the policy listed in the section titled 'Administrative Matters' below.

Presentation Requirements

All assessed materials should be neat and clear, and demonstrate professionalism. Guidance can be found in the School's publications Standard Specification for the Presentation of Student Written Assignments and In a Nutshell, both of which are provided in The Guide (see School General Office if you do not have a copy).

Individual Problem Solving Exercises must be submitted to your demonstrators on paper during the problem solving session time and include your name and student number. All other assignments must be submitted to Moodle electronically.

Assessment Scheme

Marks	Assessment	Reason for assessment	Targeted student learning outcomes
15	3 x Tests (5 marks each)	To assess and provide feedback to you on your basic progress in Learning Outcomes 1-4 periodically throughout the term.	1, 2, 3, 4
6	Group Project	To give you experience in analysing trusses within the context of the real world, working in groups, and in presenting analysis and evaluating the analysis of your peers.	1, 2, 3, 4, 5

16	8 x Adaptive eLearning Tutorials (2 marks each)	These activities are designed to allow you to explore fundamental threshold concepts and to demonstrate your ability to think critically and solve problems related to these concepts.	3
12	4 x Moodle Quiz (3 marks each)	To provide you with rapid feedback on your ability to solve problems related to current topics in the course and to familiarize you with the format and types of questions to be found on the Final Exam. You will have unlimited chances to answer until the deadline.	1, 2, 3, 4
8	Shear Force & Bending Moment Lab Exercise	To provide you with hands-on experience with experimental rigs, and with writing formal engineering reports.	1, 2, 3, 4, 5
8	Problem Solving Exercises (PSEs) (1 mark each, but taking the best six marks and scaling them to a mark out of 8)	To provide you with feedback in demonstrating the correct processes for solving problems.	1, 2, 3, 4
35	**Final exam**	To provide you a final chance to show your achievement of Learning Outcomes 1-4.	1, 2, 3, 4
Total 100			

Assessment Schedule

Week	Assessments	Marks	Due Dates
2	Problem Solving Exercise 1 Moodle Quiz 1	1 3	Friday 13/3, 5pm Friday 13/3, 5pm
3	Test 1 Adaptive eLearning: FBDs	5 2	Friday 20/3, 3pm Friday 20/3, 5pm
4	Problem Solving Exercise 2 Adaptive eLearning: Trusses	1 2	Friday 27/3, 5pm Friday 27/3, 5pm
5	Moodle Quiz 2 Group Assignment: Trusses	1 4	Thursday 2/4, 5pm Thursday 2/4, 5pm
6	Problem Solving Exercise 3 Adaptive eLearning: Projectile Motion Adaptive eLearning: Friction Peer Assessment of Group Assignment	1 2 2 2	Friday 17/4, 5pm Friday 17/4, 5pm Friday 17/4, 5pm Friday 17/4, 5pm
7	Problem Solving Exercise 4 Adaptive eLearning: Centroids	1 2	Friday 24/4, 5pm Friday 24/4, 5pm
8	Test 2 Adaptive eLearning: Impulse & Momentum	5 2	Friday 1/5, 3pm Friday 1/5, 5pm

9	Problem Solving Exercise 5 Moodle Quiz 3 Adaptive eLearning: Work & Energy Laboratory is open for completion of the Shear Force & Bending Moment experiments during this week.	1 3 2	Friday 8/5, 5pm Friday 8/5, 5pm Friday 8/5, 5pm
10	Problem Solving Exercise 6 Adaptive eLearning: Shear Force & Bending Moment Laboratory Report: Shear Force & Bending Moment	1 2 8	Friday 15/5, 5pm Friday 15/5, 5pm Friday 15/5, 5pm
11	Problem Solving Exercise 7 Moodle Quiz 4	1 3	Friday 22/5, 5pm Friday 22/5, 5pm
12	Test 3	5	Friday 29/5, 3pm
13	Problem Solving Exercise 8	1	Friday 5/6, 5pm
Exams	Final Exam	35	TBA – Exam Period

Special Consideration and Supplementary Assessment

For details of applying for special consideration and conditions for the award of supplementary assessment, see *Administrative Matters*, available from the School website.

6. ACADEMIC HONESTY AND PLAGIARISM

Plagiarism is using the words or ideas of others and presenting them 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 booklet which provides essential information for avoiding plagiarism: https://my.unsw.edu.au/student/academiclife/Plagiarism.pdf

There is a range of resources to support students to avoid 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. Information is available on the dedicated website Plagiarism and Academic Integrity website: http://www.lc.unsw.edu.au/plagiarism/index.html

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

Further information on School policy and procedures in the event of plagiarism is presented in a School handout, Administrative Matters, available on the School website.

7. 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 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/
Library http://info.library.unsw.edu.au/web/services/services.html

8. COURSE EVALUATION AND DEVELOPMENT

The UNSW CATEI process will be used to survey your responses to this course. In this way, we can identify the goods bits to keep for next time and the bits that need improving.

Feedback from a previous instance of the course suggested that a large number of small assessment tasks was conducive to continued online learning and this has been maintained. Prior to that, improvements included moving to a single platform for online content delivery and assessment.

You are also encouraged to comment on all aspects of the course using the discussion forum within Moodle while the course is being conducted.

9. ADMINISTRATIVE MATTERS

You are expected to have read and be familiar with *Administrative Matters*, available on the School website. This document contains important information on student responsibilities and support, including special consideration, assessment, health and safety, and student equity and diversity.

Information on general Occupational Health and Safety policies and expectations is available here: www.ohs.unsw.edu.au

Enclosed footwear is a prerequisite for entering the school laboratories. Further information regarding the OHS requirements for laboratory work will be available on Moodle.

Examination procedures and advice concerning illness or misadventure are detailed in the Administrative Matters document, and in the event of any discrepancy between this course outline and that document precedence will be given to this course outline.

M Whitty & N Kinkaid February 2015