ENGG1802 Engineering Mechanics

Course Coordinator:

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Unit of Study Description
6 credit points, Flexible Core Unit, Semester 2

Classes
Lectures: Two 1hr lectures each week.
Tutorials: 3hr per week consisting of one 2hr session and one 1hr session.

Course Website: **http://www.eng.usyd.edu.au/webnet/ENGG1802/index.html**

Syllabus Summary
The unit covers the following topics: Introduction to Engineering Mechanics (or Newtonian Mechanics), vectors, forces, components; moments - 2D and 3D; free body diagrams; 2D equilibrium; 3D equilibrium; trusses, frames and machines; centroids and centres of mass; friction; bearings and wedges; beams - internal and external effects; distributed actions; fluid statics; virtual work; potential energy and stability.

Unit of Study Objectives
The unit aims to provide students with an understanding of and competence in solving statics problems in engineering. Tutorial sessions will help students to improve their group work and problem solving skills, and gain competency in extracting a simplified version of a problem from a complex situation. Emphasis is placed on the ability to work in 3D as well as 2D, including the 2D and 3D visualization of structures and structural components, and the vectorial 2D and 3D representations of spatial points, forces and moments.

The relationship of this Unit to previous UoS:
This is a first course in engineering statics. It is assumed that students have studied the equivalent of HSC three unit maths and two unit physics, and also know about vector algebra.

The unit is a building block for later mechanics-related units and streams in Civil, Aeronautical, Space, Mechanical and Mechatronic Engineering, including:

MECH/AERO: The subject is a pre-requisite for AMME2500 Engineering Dynamics, which is a pre-requisite for AMME3500 System Dynamics and Control. It is also a pre-requisite for AMME2301 Mechanics of Solids, which is a pre-requisite for MECH3361 Mechanics of Solids 2. It is a pre-requisite for MECH3660 Manufacturing Engineering, and assumed knowledge for MECH3460 Mechanical Design 2.

CIVIL: The subject is assumed knowledge for CIVL2110 Materials, CIVL2201 Structural Mechanics, CIVL2230 Intro to Structural Concepts and Design, and CIVL2410 Soil Mechanics, all of which are assumed knowledge for the 3rd year units of study CIVL3411 Foundation Engineering, CIVL3206 Steel Structures 1, CIVL3205 Concrete Structures 1, CIVL 3235 Structural Analysis, and the 4th year units of study CIVL4412 Geotechnical Engineering, CIVL4413 Environmental Geotechnics, CIVL4903 Civil Engineering Design, CIVL4222 Finite Element Methods, CIVL4218 Concrete Structures 2 and CIVL4220 Steel Structures 2.

Relationship between this UoS and University generic attributes:
This unit of study is aimed at developing the students generic attributes in the following areas:
- Knowledge skills
  - Develop a body of knowledge in the field of statics
  - Be able to apply theory to practice in familiar and unfamiliar situations
  - Be able identify, access, organize and communicate knowledge gained.
- Thinking skills

    - Be able to exercise critical judgment
    - Be an independent thinker
    - Adopt a problem solving approach
- Personal skills
    - The ability to work with others
- Practical Skills
    - Test hypotheses experimentally
    - Apply technical skills

The University generic attributes can be found at http://policy.rms.usyd.edu.au/000005o.pdf

Student Learning Outcomes:

By the end of this UoS, students will be able to:

- Draw a correct free body diagram for any engineering entity
- Calculate the value of unknown forces and moments acting on any three dimensional object from the equilibrium equations
- Calculate the force in an internal member of a simple structure
- Calculate the forces acting as a result of two objects in contact
- Calculate the distributed forces such as body forces and in fluids statics
- Calculate friction forces
- Find the centre of mass or centroid of an object
- Use energy methods
- Be able to outline a logical approach for solving a complex engineering problem

Learning Situations

Lectures:

There are two lectures each week. Students are expected to *buy the text book and read the relevant sections prior to the lectures*. During the lectures basic material will be presented with an emphasis on explaining the more difficult concepts, and presenting worked solutions of sample problems.

There are two lecture streams, Monday/ Friday and Tuesday/Friday.

You **MUST** go to the lectures **exactly** as specified on your University generated timetable since both lecture streams are full and the lecture stream is tied to your tutorials. **Your attendance to the lectures will be examined randomly over the semester**.

Lecture time and location:

Stream 1: Lecturer **Luming Shen**

- Monday 9 am, Friday 10 am, in Carslaw Lecture Theatre 157

Stream 2: Lecturer: **Ahmad Jabbarzadeh**

- Tuesday 9 am in Carslaw Lecture Theatre 159
- Friday 11 am, in Institute Lecture Theatre 1

Tutorials:

Attendance at tutorials is compulsory. You **MUST** attend the tutorials specified on your University generated timetable. You will be in the **same** tutorial group for all of your sessions (your tutor will check your attendance). The tutorial problems from the specified text are listed on the following page.

Week	Dates	Tutorial problems
		Volume 1 – Statics
1	28/07-1/08/08	1/1, 1/2, 1/3, 1/4, 1/7, 1/9
2	04/08-08/08/08	2/12, 2/16, 2/19, 2/22, 2/41, 2/44, 2/49
3	11/08-15/08/08	2/57, 2/64, 2/65, 2/68, 2/74, 2/76,2/81
4	18/08-22/08/08	2/93, 2/100, 2/113, 2/120, 2/132,2/139
5	25/08-29/08/07	2/149, 2/154, 2/160, 3/4, 3/12, 3/25, 3/44
6	01/09-05/09/08	3/48, 3/52, 3/59,3/70, 3/89, 3/107, 3/114
7	08/09-12/09/08	4/3, 4/9, 4/27, 4/34, 4/53, 4/58, 4/63
8	15/09-19/09/08	4/76, 4/98, 4/111, 5/1,5/7,5/12,5/18
9	22/09-26/09/08	5/36, 5/53, 5/66,5/98,5/111,5/115, **5/**118
10	6/10-10/10/08	5/122, 5/137, 5/143, 5/180, 5/197, 5/203, 5/222
11	13/10-17/10/08	6/1,6/3,6/11,6/17, 6/47,6/94, 6/54
12	20/10-24/10/08	6/58, 6/97,6/109, 7/1,7/8, 7/20,7/26
13	27/10-31/10/08	7/27,7/34, 7/36, 7/52

The tutors will assist you with your understanding of the knowledge needed to solve the problems. They will not solve the problems for you. Solutions to some of the problems will be made available from time to time. You should have a logbook where you have to solve the problems assigned for your tutorial session. The logbooks should contain your solutions. At the last tutorial session of the week your tutor will sign it to verify you have attempted those problems either in the tutorial sessions or before attending the tutorials. During tutorials students might be randomly selected to present their solutions to the class. The problems listed for the tutorial sessions are representative and minimum to be tackled by the students. The students are encouraged to solve as many as possible problems from the text to master their learning and competency.

Tutors will NOT discuss with you any aspects of assignments.

Assessment:

Attendance at the three hours of tutorial each week **is compulsory**. If you miss more than 10% of the tutorials (4 hours for the semester) you will not have met the attendance requirements and will fail the unit of study with a maximum mark of **45%**.

Assessment marks for all problems will be based upon:

- Layout of the solution (communication)
- Solution method (clearly showing the students understanding of principles)
- Correct answer

Assignments 30%:

The assignment problems will be distributed at lectures 2 weeks before the assignment is due.

Assignment 1	10%	Due 5:00 pm Friday 15 August 2008 (week 3)
Assignment 2	10%	Due 5:00 pm Friday 12 September 2008 (Week 7)
Assignment 3	10%	Due 5:00 pm Friday 24 October 2008 (Week 12)

If you are in **Stream 1**, the assignment is to be submitted to the main office (R418) of the Civil Eng. building.
If you are in **Stream 2**, the assignment is to be put in the assignment slot, level 3 of the Mechanical Eng. building.

NOTE: Late submissions will be penalised 10% of full mark for every day or part thereof that the assignment is late.

Quizzes 70%:

There will be 3 by 1 hour quizzes. These will be given during your tutorial hours of the specific week.
The quizzes will be closed book and an equation sheet will be supplied if necessary. The quizzes will be based on the material covered up to and including the previous Friday's lecture material.

Week 4	15%	(1 hr quiz)
Week 8	25%	(1 hr quiz)
Week 13	30%	(1:30 hr quiz)

Attendance, Participation:

Attendance at tutorial sessions is **compulsory** and will be recorded. If you are not at the correct tutorial (as per your University generated timetable) you will be marked absent. For each tutorial hour that you miss you will be penalised 1% from your final mark. Unsatisfactory attendance (**missing more than 4 hours**) will result in failure of the subject.

Unit of Study Program:

Week	Dates	Lecture	Topics	Text Reference (vol 1) STATICS
1	28/07-	1	Introduction, Vectors, Newton's Laws	Chapter 1
	1/08/08	2	Forces, Moments	2/1, 2/2, 2/3, 2/4
2	04/08-	3	Couple, Resultants	2/5, 2/6
	08/08/08	4	Revision: 2D examples	
3	11/08-	5	3D force systems	2/7
	15/08/08	6	Moments and Couples in 3D	2/8
4	18/08-	7	Resultants in 3D	2/9
	22/08/08	8	Revision: 3D examples	
5	25/08-	9	Equilibrium in 2D	3/1, 3/2
	29/08/07	10	Equilibrium in 2D (continued)	3/3
6	01/09-	11	Equilibrium in 3D	3/4
	05/09/08	12	Plane Trusses, Method of Joints	4/1, 4/2
7	08/09-	13	Method of Joints; Method of Sections	4/3**,** 4/4
	12/09/08	14	Space Trusses, Frames and Machines	4/5, 4/6

8	15/09-19/09/08	15	Revision: Trusses and equilibrium examples	
		16	Centre of Mass and Centroids	5/1, 5/2, 5/3, 5/4
9	22/09-26/09/08	17	Centre of Mass and Centroids (continued)	
		18	Beams- external and internal effects	5/6, 5/7
Semester break				
10	6/10-10/10/08	(19)	Note: No lecture on Mon 6 Oct Due to Public Holiday	
		20	Fluid Statics	5/9
11	13/10-17/10/08	21	Types of Friction, Dry Friction	6/2, 6/3
		22	Wedges, Flexible belts	6/4, 6/8
12	20/10-24/10/08	23	Work, Virtual Work, Work Equilibrium	7/2, 7/3
		24	Work Equilibrium (Cont), Potential Energy and Stability	7/3, 7/4
13	27/10-31/10/08	25	Revision	
		26	Advanced topics	

Difficulties and special consideration

Students with any difficulties or circumstances that are likely to affect their performance in this course are advised to discuss them with the stream coordinators (Stream 1, Luming Shen; Stream 2, Ahmad Jabbarzadeh) as soon as possible, so that appropriate allowances, if any, can be made to assist them and facilitate their performance. Students are advised to familiarise themselves with the University's and the Faculty's policies with respect to special consideration for performance in their courses due to illness, misadventure, or any other circumstances (see http://www.eng.usyd.edu.au/policies.shtml for details). Requests for special consideration should always be made on the official "special consideration" form, and then lodged at the engineering Faculty Office, and a copy given to the lecturer, Stream 1, Luming Shen; Stream 2, Ahmad Jabbarzadeh. All requests are treated confidentially.

Academic honesty

The University has a responsibility to the community in general and the engineering profession that graduating students have adequately displayed competency in the required areas. It is unfortunate that a small minority of students sometimes try to submit work which is not their own and hence not fairly demonstrate that competency. Working alone and in groups are both important components in developing the required knowledge. Legitimate co-operation between students is highly encouraged; however direct copying of another student's work is plagiarism, unacceptable, and unfair to fellow students, the community and the engineering profession. Submissions that are identified as copies will be marked zero. Students should be wary of giving an assignment to a fellow student, but are highly encouraged to help their colleagues through difficulties. Students are encouraged to examine to university policy on legitimate co-operation and plagiarism via http://www.usyd.edu.au/policy/, and the School of Civil Engineering Statement on Academic Honesty at http://www.civil.usyd.edu.au/current/undergraduate/honesty.shtml. It is acknowledged that the main reason students are tempted to copy someone else's work is due to either (a) not fully understanding the concepts covered, or (b) constraints of time, rather than a deliberate attempt to deceive or cheat. The staff in this course will make every effort to assist students understanding the topics, but students must make the effort to understand by attending lectures and tutorials and asking for assistance when unsure. Similarly, the workload in this course is reasonable, and students must take the responsibility to allocate their time appropriately.

Student feedback

Students are encouraged to give positive and/or negative feedback related to this course or the school to the lecturer or tutors at any time. Without feedback, potential problems or difficulties cannot be identified and rectified.

Unit of Study References:

Text required:

J.L. Meriam and L.G. Kraige Engineering Mechanics, Wiley. Volume 1, STATICS (SI version), 6th Edition

Students are encouraged to search the library for additional reading references in Engineering Mechanics.