ENGG1300
FUNDAMENTAL MECHANICS

Lecture 0

Course Introduction

KHL

Course Objectives

- This is an introductory course for first-year engineering students.
- The primary objective is to introduce students to the fundamental concepts and principles of STATICS and DYNAMICS and their applications to solve practical problems.

- Statics – the study of objects at rest (in static equilibrium)
- Dynamics – the study of objects in motion
- The study of statics and dynamics provides the basis and foundation for further study in all engineering disciplines, particularly in Civil and Mechanical Engineering.

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Course Learning Outcomes

- At the end of this course, students who fulfil the requirements of this course will be able to:

  1. draw a free body diagram and identify the reaction forces/moments acting on the free body due to support conditions and restraints

  2. construct equilibrium equations to solve statically determinate problems

  3. use vector algebra to solve 3-D static problems

  4. determine stresses and strains of axially loaded members using Hooke's law

  5. calculate centroid, second moment of area and polar moment of area of compound cross-sections

  6. design and fabricate a model to satisfy specific requirements by applying the fundamental principles of mechanics

  7. apply concepts of kinematics and kinetics to solve mechanics problems

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Examples of practical Statics & Dynamics problems

Determining the reaction forces in bridge piers and designing the size of the structural members.

Determining the accelerations in roller coaster cars.

Determining the impulse force in the collision of cars

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Important Course Information

- Prior knowledge:
  - ➤ Knowledge on Physics, Linear Algebra (mainly vectors) and Calculus are required in this course.
  - ➤ Students without prior knowledge of Calculus are STRONGLY ADVISED to take this course in the next semester, after taking MATH1011 in this semester.

- Course website: MOODLE

  Selected course materials and announcements will be posted on Moodle. Students are advised to visit Moodle regularly.

- Calculators:

  An approved calculator will be required for the examination.
  The list of approved calculators can be found in the link below:
  http://www.exam.hku.hk/pdf/list.of.cal_092019.pdf

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Teaching Staff

Name		Contact details
Dr. Ada KH Law (CivE)		adalaw@hku.hk
Dr. Ray KL Su (CivE)		klsu@hku.hk
Dr. HL Ye (CivE)		hlye@hku.hk
Dr. L Xu (ME)		xulizhi@hku.hk

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Course Content

Week	Lecture topics	Responsible lecturer
1-3	**FORCES SYSTEMS AND EQUILIBRIUM** • Force vectors • Moments and couples • Determination of resultant forces • Conditions of equilibrium • Free-body diagram	Dr. KH Law
3-6	• Statically determinate structures **AXIALLY LOADED MEMBERS** • Axial stress and strain • Hooke's law • Young's modulus and Poisson's ratio • Deformations of members subjected to axial loading	Dr. KL Su
6-8	**BEAMS IN BENDING** • Symmetric and asymmetric beams in bending • Section properties: Centroid, first and second moment of area • Parallel axes theorem • Polar moment of area and perpendicular axes theorem	Dr. H Ye

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Course Content

Week	Lecture topics	Responsible lecturer
8-9	**KINEMATICS** • Rectilinear kinematics • Cartesian coordinates and curvilinear coordinates • Curvilinear motion, rotation about a fixed axis, rotating reference frames • General motion of a rigid body	Dr. L Xu
10-11	**KINETICS** • Newton's Second Law, Equations of motion • Principle of conservation of linear momentum, Principle of conservation of angular momentum • Friction • Simple harmonic motion	Dr. L Xu
11-12	**MODEL CHALLENGE / INDIVIDUAL PROJECT** • Design and fabricate a model to satisfy specific requirements by applying the fundamental principles of mechanics	Dr. H Ye

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Lectures

- You are expected to attend all lectures.
- There are officially 3 hours of lectures/tutorials per week.
- Please read the notes or the appropriate chapter in the recommended textbook before the class.

Communication

- It is essential that students follow the Communication protocol. This will ensure that the lecturers can respond to questions in a timely manner and that all students will have access to the same information.
- Students may only email the course lecturers regarding private/confidential matters.
- In case you have any questions on the course materials, please make the best use of the following:

  a. You may ask the lecturer during the break or immediately after class outside the classroom.

  b. You may go to any scheduled consultation sessions.

  c. You may post your questions in the Discussion Forum in Moodle.

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Communication

- All general questions about the course materials MUST be posted to the Discussion Forum in Moodle. Discussion posts should always:
  - ➢ Be polite and respectful of other people's points of view & comments
  - ➢ Avoid comments that are insulting
  - ➢ Be concise
  - ➢ Have a thread title that is meaningful and logical
- Since there are 5 parts (involving 4 teachers) in this course, 5 Discussion Forums have been created and please post your questions accordingly.
- Teachers will monitor the Discussion Forums regularly to provide timely response to your questions.
- Students can also help to answer the questions raised by your peers.
- Wrong post of questions will NOT be answered.

Consultation sessions

- To support students' learning, additional consultation sessions will be arranged and details will be announced in Moodle in due course.
- Consultation sessions will be also arranged before the examination to help students prepare for the examination.

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Assessment

- Assessment tasks in this course are described below:

Assessment Type	Weighting	Description
Continuous Assessment	40%	4 Assignments
Examination	50%	2-hour examination
Practical Work	10%	Model challenge*

- You have to pass **BOTH** "Practical Work" and "Continuous Assessment plus Written Examination".
- * For students who cannot come to Hong Kong, please inform Dr. Ye for further arrangement and he will mention this in the briefing session as well.

Submission of Assignments

- You are reminded to submit your assignments to **Moodle** sufficiently early before the deadline taking into account the time needed and possible network congestion or sudden computer break-down in the last few minutes before the deadline.

- **Mark deduction** will be imposed strictly for **late submissions** in accordance with the Departmental policy.

- Network congestion and break-down of computers will **NOT** be accepted as a reason for late submission.

- Please submit your assignments in **one pdf file** with the size not exceeding 20 MB into Moodle.

- Please indicate your **University Number** and **Name** on the first page of the submission and ensure that the submission is (a) the correct one; (b) complete; and (c) legible. It is advisable to check after submission. An illegible submission may be given ZERO mark.

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Submission of Assignments

- Please note the Departmental policy regarding mark deduction on late submission of assignments:

Time overdue	Percentage of total marks to be deducted from overdue reports/assignments
For BEng reports/assignments	
≤ 3 days	10%
> 3 - 5 days	50%
> 5 days	100%

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Schedule of Lectures (**ENGG1300-1A**)

Teaching Week	Date (Mon) 12:30 - 14:20 WLGH	Lecture Topic(s)	Date (Thu) 12:30 - 13:20 WLGH	Lecture Topic(s)
1	------	-----------	2 Sep	Dr. KH Law
2	6 Sep	Dr. KH Law	9 Sep	Dr. HL Ye (Model challenge)
3	13 Sep	Dr. KH Law	16 Sep	Dr. KH Law
4	20 Sep	12:30 - 13:20: Dr. KH Law 13:30 - 14:20: Dr. KL Su	23 Sep	Dr. KL Su
5	27 Sep	Dr. KL Su	30 Sep	Dr. KL Su
6	4 Oct	Dr. KL Su	7 Oct	Dr. H Ye
Reading week	11 Oct	-----------	14 Oct	-----------
7	18 Oct	Dr. H Ye	21 Oct	Dr. H Ye
8	25 Oct	Dr. H Ye	28 Oct	Dr. H Ye
9	1 Nov	Dr. L Xu	4 Nov	Dr. L Xu
10	8 Nov	Dr. L Xu	11 Nov	Dr. L Xu
11	15 Nov	Dr. L Xu	18 Nov	Dr. L Xu
12	22 Nov	Dr. H Ye (Model challenge)	25 Nov	Dr. H Ye (Model challenge)
13	29 Nov	Dr. H Ye (Model challenge)	------	-----------

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Schedule of Lectures (ENGG1300-1B)

Teaching Week	Date (Tue) 10:30 - 12:20 RHT	Lecture Topic(s)	Date (Fri) 11:30 - 12:20 RHT	Lecture Topic(s)
1	------	-----------	3 Sep	Dr. KH Law
2	7 Sep	Dr. KH Law	10 Sep	Dr. H Ye (Model challenge)
3	14 Sep	Dr. KH Law	17 Sep	Dr. KH Law
4	21 Sep	10:30 - 11:20: Dr. KH Law 11:30 - 12:20: Dr. KL Su	24 Sep	Dr. KL Su
5	28 Sep	Dr. KL Su	1 Oct	**Holiday**
6	5 Oct	Dr. KL Su	8 Oct	Dr. KL Su
Reading week	12 Oct	-----------	15 Oct	-----------
7	19 Oct	Dr. H Ye	22 Oct	Dr. H Ye
8	26 Oct	Dr. H Ye	29 Oct	Dr. H Ye
9	2 Nov	10:30 - 11:20: Dr. H Ye 11:30 - 12:20: Dr. L Xu	5 Nov	Dr. L Xu
10	9 Nov	Dr. L Xu	12 Nov	Dr. L Xu
11	16 Nov	Dr. L Xu	19 Nov	Dr. L Xu
12	23 Nov	Dr. H Ye (Model challenge)	26 Nov	Dr. L Xu
13	30 Nov	Dr. H Ye (Model challenge)	------	------------

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Textbooks/References

1. Hibbeler, R.C., *Engineering Mechanics: Static & Dynamics*, 13th Edition, Pearson, 2013

2. Beer, F.P., Johnston, E.R. and DeWolf, J.T., *Mechanics of Materials*, 6th Edition, McGraw Hill, 2013.

3. Gere, J.M. and Goodno, B.J., *Mechanics of Materials*, 8th Edition, Cengage Learning, 2013.

4. Hannah, J. and Hillier, M.J., *Applied Mechanics*, Pitman, 1995.

5. Riley, W.F., Sturges, L.D. and Morris, D.H., *Statics and Mechanics of Materials*, Wiley, 1995.

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