

ENGG 130A Engineering Mechanics I

3 Credits, 3 hours lecture. 2 hours lab, 4.0 Engineering Units for University of Alberta

This course focuses on static equilibrium of forces, principles of two and three dimensional equilibrium, analysis of statically determined structures, trusses and frames, and principles of friction and virtual work.

Prerequisites MATH 30-1, MATH 31, PHYS 30

Co-requisites: MATH 100

NOTE: ENGG 130 is restricted to Engineering Students

Instructor

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Office Hours

Monday 11:00 – 11:50
Thursday 12:00 – 13:50
Friday 11:00 – 12:50

Hours of Instruction

Tuesday 09:00 – 10:20, Room CC239 (Lecture)
Thursday 09:00 – 10:20, Room CC239 (Lecture)
Wednesday 10:00 – 11:50, Room CC239 (Lab)

Required Resources

- **Engineering Mechanics: Statics and Dynamics**, R.C. Hibbeler. Singapore – Pearson, 2016 (14th Edition, with Mastering Engineering)
- Engineering notepad, lecture notebook and separate bound notebook for assignments

Course Outcomes

Upon successful completion of the course, students will be able to:

- Carry out idealization of a physical system, and know how to set up and solve a statics problem.
- Resolve forces in planar and three-dimensional space.
- Draw a free-body diagram of a rigid body and develop the equations of equilibrium.
- Calculate a moment about an axis in 2D and 3D and to reduce a simple distributed loading to a resultant force having a specified location.
- Apply equilibrium concept/techniques to solve simple 2D structural problems
- Analyze friction forces.

- Compute the centre of mass for discrete systems and continuous bodies of arbitrary shape in 2D
- Calculate the moment of inertia for a simple planar object.

Evaluation

Item	Percentage Allotted
Assignments	2.5%
Tutorials	17.5%
Midterm Exam	35%
Final Exam	45%
TOTAL	100%

A grade of C- is required for progression or transfer.

Advice to Prospective Engineers

Engineers are problem solvers. If you want to succeed in engineering it is important that you learn how to organize your thoughts, to analyze, set up, and solve problems and to experience the often frustrating trials that arise in doing so. The best way to learn and retain knowledge is by practicing; the more problems you attempt and complete, the more experienced and confident you will become.

Engineering is a demanding profession: you must be able to clearly articulate solutions to complex problems in a timely manner. This course will encourage you to develop the work habits and skills necessary to submit clear and concise work on deadline. To reinforce this, keep in mind that sloppy work will not be graded in any component of this course, and late work will also not be accepted.

Teamwork is pervasive in engineering, but this is an activity that takes place among competent peers. Teamwork is a privilege that comes with competence. It is not a way to get by when you lack the skills to do the work yourself. In this course, working in groups can be helpful and is not discouraged, but you must be careful not to use teamwork to coast through an assignment or project; any work that you turn in must be your own (see rules on plagiarism below).

Engineering Orientation

All engineering students are required to attend a series of orientation sessions during the first week of the term. **Successful completion of the exercises on lab safety and academic integrity is a pre-requisite for submitting any written or on-line work for grading.**

iLearn and Lecture Notes

You are responsible for keeping a complete record of classroom work (whiteboard notes, interactive problems, classroom exercises) in a proper notebook. Material projected onto your monitors or on the screen at the front of the classroom is posted to iLearn at the end of each week but does not constitute a complete record of lecture materials.

Assignments

It is important to start the problems early and not put them off until the day before they are due. This course uses web-based assignments: you will need to use the access kit purchased with your textbook to access the assignments; instructions will be provided in the first lecture. Assignments must be completed via the assignment web site before the posted due dates; partially completed assignments receive the

score achieved before the due date.

- **You are required to keep fully worked out solutions to your assignments in a bound notebook;** your instructor may ask to see these solutions at any time, and you should be prepared to produce these solutions when demanded.
- You may rework assignments after the due date for practice; this will have no effect on your score.
- Accurate sketches and correct free body diagrams (FBDs) are a must and are emphasized in all work. The FBD is the single most important tool for the solution of mechanics problems. The important elements of a good problem-solving technique are:
 - correct problem set-up with the assumptions and what is sought,
 - correct analysis with appropriate diagrams,
 - correct numbers and units, and
 - proper interpretation of the solution in both units and directions.

NOTE: missed or incomplete assignments may result in a grade of F for the course.

Labs/Tutorials: YOU MUST BRING YOUR TEXTBOOK TO ALL TUTORIAL PERIODS

Two hours per week will be used for laboratory/tutorial exercises. Tutorials are designed to help you develop your problem solving skills by having you work out a complete, written solution to a textbook problem or selected reading from your text under the guidance of your instructor. Assessment of this component will be based on the quality and clarity of the written solution (getting the correct answer is not a significant component of the assessment). Tutorial assignments are due at the end of the tutorial period, unless otherwise indicated. You are expected to work on tutorial problems by yourself, though you may discuss your work with your instructor or a classmate; collaborative solutions are not allowed unless explicitly stated by your instructor.

Midterm Exam

There will be one midterm exam in this course. The midterm exam will be closed book, paper-based, hand-written and will cover all topics covered up to the date of the exam. The one-hour midterm exam takes place during a lab period in the seventh week. The structure of the midterm exam will be a series of long questions. You are expected to know fundamental relations and physical laws. No formula sheet will be supplied, although some hints may be given in some problems where a specialized identity or relation may be required. Only simple scientific calculators are allowed during examinations.

Final Exam

The final exam in this course will be closed book, paper-based, hand-written and will cover all topics covered for the entire term. The two-hour final exam will take place during the exam period at the end of the term. Just like the midterm exam, the structure of the final exam will comprise of a series of long questions. You are expected to demonstrate mastery of the subject. You will be expected to solve a set of problems, some similar to work you have previously done, some more challenging. The assignments and tutorials are designed to help you prepare for this examination, so make sure you take full advantage of these exercises to prepare for the final exam. You are expected to know fundamental relations and physical laws. A formula sheet will be supplied. Only simple scientific calculators are allowed during examinations.

Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory Progression	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
Minimum Pass	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

Proposed Schedule of Topics

Week	Chapter/Section	Main Topics	Lab/Tutorial
1	1.1-1.6	General Principles: - units, procedures for analysis	
2	2.1-2.9	Force Vectors: - Scalars and vectors, vector operations - Force vectors along a line	Selection of problems from Chapter 2
3	3.1-3.4	Equilibrium of a Particle: - the free-body diagram, 2D and 3D force systems	Selection of problems from Chapter 3
4	4.1-4.5	Force System Resultants: - Moments	Selection of problems from Chapter 4
5	4.6-4.9	Force System Resultants: - Simplification of force/couple systems	Selection of problems from Chapter 4
6	5.1-5.6	Equilibrium of a Rigid Body:	Selection of problems from Chapter 5
7		Midterm Review; Midterm	
8	6.1-6.6	Structural Analysis: - Simple trusses - Space trusses	Selection of problems from Chapter 6 - popsicle stick bridge activity
9	7.1-7.3	Internal Forces: - Internal Loadings	Selection of problems from Chapter 7
10	7.1-7.3	Internal Forces: - Shear and moment equations	Selection of problems from Chapter 7
11	8.1-8.3	Friction: - Dry friction; friction in various systems	Selection of problems from Chapter 8
12	9.1, 9.2, 9.4	Centre of Gravity and Centroid:	Selection of problems from Chapter 9
13	9.1, 9.2, 9.4	Centre of Gravity and Centroid:	Selection of problems from Chapter 9
14	10.3-10.5	Moments of Inertia:	Selection of problems from Chapter 10

Please Note:

Date and time allotted to each topic is subject to change.

Performance Requirements and Student Services

Student Responsibilities

It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the [Keyano College credit calendar](#). The Keyano College credit calendar also has information about Student Rights and Code of Conduct. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a student's learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and notes that may be due.

Academic Misconduct

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own;
- The use of unauthorized aids in assignments or examinations (cheating);
- Collusion or the unauthorized collaboration with others in preparing work;
- The deliberate misrepresentation of qualifications;
- The willful distortion of results or data;
- Substitution in an examination by another person;
- Handing in the same unchanged work as submitted for another assignment; and
- Breach of confidentiality.

The consequences for academic misconduct range from a verbal reprimand to expulsion from the College. More specific descriptions and details are found in the Student Rights and Code of Conduct section of the Keyano College credit calendar. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and Code of Conduct Policies.

In order to ensure your understanding of the concept of plagiarism, [you must successfully complete the online tutorial found on ilearn.keyano.ca. Then print the certificate, sign it, and show it to each of your instructors.](#) Your course work may not be graded until you show this signed certificate.

Specialized Supports

The Student Services Department is committed to Keyano students and their academic success. There are a variety of student supports available at Keyano. Due to the continuing situation with the Covid-19 pandemic, the offered support services will be implemented through a model to respond to the restrictions in force at the time. In-person and virtual services will be offered. All Alberta Health Services guidelines will be followed for in-person appointments—wear a mask, maintain two meters of physical distance, use hand sanitizer, and stay home if you are unwell.

All student services are available during Keyano business hours: Monday to Friday, 8h30-16h30. The College is closed for statutory holidays. If you require support outside of regular business hours, please inform the support service team, and we will do our best to accommodate your needs.

Accessibility Services: provides accommodations for students with disabilities. Students with documented disabilities, or who suspect a disability, can meet with a Learning Strategist to discuss

their current learning barriers and possible accommodations. Students who have accessed accommodations in the past are encouraged to contact us to request them for the semester. Please note that requesting accommodations is a process and requires time to arrange. Contact us as soon as you know you may require accommodations. For accessibility supports and to book an appointment, please contact accessibility.services@keyano.ca.

Accessibility Services also provides individual and group learning strategy instruction for all students, as well as technology training and supports to enhance learning. Meet with a Learning Strategist to learn studying and test-taking strategies for online classes. Schedule an appointment with the Assistive Technology Specialist to explore technology tools for learning. Book an appointment today by emailing accessibility.services@keyano.ca

Wellness Services: offers a caring, inclusive, and respectful environment where students can access free group and individual support to meet academic and life challenges. Mental Health Coordinators offer a safe and confidential environment to seek help with personal concerns. Students may access services virtually and in-person.

Wellness Services welcomes students to participate in any of the group sessions offered throughout the academic year addressing topics including mindfulness and test anxiety.

Individual appointments can be made by emailing wellness.services@keyano.ca.

Library Services: provides students with research and information supports as they engage in their studies. Library staff are available to support you both online and in-person throughout the semester. For a detailed list of library supports and services, go to www.keyano.ca/library. For all inquiries, please email askthelibrary@keyano.ca or chat with us online.

Begin your research with the [Library's FIND page](#). Search for information and sources for your assignments using the OneSearch, the Library's Catalogue, or by searching in a specific database selected from the [A-Z Database List](#).

Individual support with us is available. For support with citations, research and other information needs, appointments can be booked using the online [Book A Librarian Calendar](#). For support with Moodle, educational tools for assignments, Microsoft Office, Zoom, Teams and more, book an appointment using the online [Educational Technology Support Calendar](#).

Research and subject guides are helpful resources when beginning your research, assignment, using new educational technology, or addressing other information needs. To view a subject or course-specific guide, check out the complete listing of online [Subject Guides](#).

To access additional research resources, including Citation Guides (APA, MLA, Chicago, or IEEE), go to the [Research Help Library page](#).

The Loanable Technology collection is available to support students in their learning pursuits, whether online, in person or both. Items available for borrowing include mobile projectors, webcams, noise-cancelling headphones, Chromebooks, and laptops. For an up-to-date list of technology available for borrowing as well as support available, go to the Library's [Loanable Technology webpage](#).

Academic Success Centre: The Academic Success Centre is a learning space in the Clearwater Campus (CC-119) at Keyano College. Students can gather to share ideas, collaborate on projects, get new perspectives on learning from our Academic Content Specialists, or use the Centre's educational resources. The Academic Success Centre provides academic support services to students registered in credit programs at Keyano College in the form of individual tutoring, writing support groups, facilitated study groups, workshops, and study space. Services are **free** to Keyano students.

Academic Content Specialists are available in the areas of Math, Science, Human Services, and English/Humanities. This covers all courses offered at Keyano. The Academic Success Coach can also be found in the Academic Success Centre.

For the most up to date information on how to book a session, please view [the Keyano Academic Success Centre homepage](#).

Academic Integrity: The goal of the Academic Success Centre is to foster a student's ability to learn effectively and independently. Students registered at Keyano College are welcome to drop by the Centre to visit with any of our Academic Content Specialists to discuss their academic concerns.

Availability: Monday to Friday: 8:30 a.m. – 4:30 p.m. Flexible times may be available upon request. Virtual and in-person sessions, please email to get in contact with our Academic Content Specialists. For the most up to date information on how to book a session, please view the [Academic Success Centre homepage](#).

Academic Success Coach: offers you support and access to resources for your academic success to help you to find the Keys to your Success. The Academic Success Coach will work with you to develop an academic success plan, develop your study and time management skills, and connect you with the right resources here at Keyano. Academic.success@keyano.ca is the best way to access resources during blended service delivery. The Academic Success Coach is located in the Skill Centre in CC-119 at the Clearwater Campus.

E-Learning

Technology and internet will impact your online learning experience. It's important that you can watch an online video and other course materials, take online quizzes and participate in a live class with your instructor and other students. Live/virtual classes will be hosted in Microsoft Teams or Zoom.

For all course delivery types, you will access your course resources on Keyano's learning management system, **Moodle (iLearn)**. Login in using your [Keyano username and password](#).

Keyano College operates in a Windows based environment, and having the correct tools for online learning is important. Here's a list of recommended system requirements.

Internet Speed

Minimum Internet speeds of 10 Mbps.

Recommended Internet speeds of 25 Mbps (especially if you are sharing your internet at home).

Check your internet speed with [Fast.com](#).

System requirements:

Microsoft Windows	Apple
<p>Minimum Requirements:</p> <p>A Windows 10 computer/laptop</p> <ul style="list-style-type: none"> · Minimum 4GB of RAM. · 10GB+ available hard drive storage. · Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). <u>Microsoft Office</u> software is free to all Keyano students and employees. · Microphone, webcam and speakers. A headset with a microphone is recommended. · System updates must be regularly installed. · Anti-Virus / Anti-Malware software 	<p>Minimum Requirements:</p> <p>A Macintosh (V10.14 and above) computer/laptop</p> <ul style="list-style-type: none"> · Minimum 4GB of RAM. · 10GB+ available hard drive storage. · Enough available hard drive space to install the Microsoft Office suite (approximately 3GB). <u>Microsoft Office</u> software is free to all Keyano students and employees. · Microphone, webcam and speakers. A headset with a microphone is recommended. · System updates must be regularly installed. · Anti-Virus / Anti-Malware software.
<p>Recommended Requirements</p> <ul style="list-style-type: none"> · 8GB of RAM · A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free. 	<p>Recommended Requirements</p> <ul style="list-style-type: none"> · 8GB of RAM · A method of backing up/synchronizing to local or cloud-based storage such as OneDrive is highly recommended. This is included if you complete the setup of KeyanoMail and download MS Office using your Keyano email for free.
<p>Chromebooks are not recommended as they are not compatible with testing lockdown browsers.</p> <p>A Microsoft Surface or iPad or iPad Pro may be possible alternatives in some program areas.</p>	

Specific Department Requirements:

Business and OA programs require Windows 10.
Other programs may utilize Windows based tools as well.

Computer Software

Students will be able to get access to Microsoft Office 365 for free using Keyano credentials by [clicking here](#).

Recording of Lectures and Intellectual Property

Students may only record a lecture if explicit permission is provided by the instructor or by Accessibility Services. Even if students have permission to record a lecture or lecture materials, students may not share, distribute, or publish any of the lectures or course materials, this includes any recordings, slides, instructor notes, etc. on any platform. Thus no student is allowed to share, distribute, publish or sell course related content (instructor, or students) without permission. It is important to recognize that the Canadian Copyright Act contains provisions for intellectual property.

The [Academic Integrity Policy](#) provides additional information on Keyano College's expectations from students as members of the intellectual community.

ITS Helpdesk

If you are having issues with your student account, you can contact the ITS Helpdesk by emailing its.helpdesk@keyano.ca or calling 780-791-4965.