

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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CC239

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Office Hours

M-F 13:00-13:50 (or by appointment)

Hours of Instruction

Monday 15:30-16:50

Tuesday 11:00-12:50

Wednesday 15:30-16:50

Required Resources

- **Engineering Mechanics: Statics and Dynamics**, R.C. Hibbeler. Singapore – Pearson, 2022 (15th Edition, with Mastering Engineering)
- Engineering notepad
- Laptop computer
- Staedtler 9 pc School Kit (ruler, protractor, compass, etc.)
- 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

Assignments	5%
Tutorials	15%
Midterm Exam	35%
Final Exam	45%
Total	100%

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

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 Minimum Pass	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.
	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

Wk	Chapter	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. 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.

A Note to Students

Engineers are problem solvers. If you want to succeed in engineering it is important 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).

iLearn and Lecture Notes

You are responsible for keeping a complete record of classroom work (lecture notes, interactive problems, classroom exercises) in a proper notebook. Lecture notes are posted to iLearn at the end of each week and do 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 Mastering Engineering access kit purchased with your textbook to access the assignments; instructions will be provided in the first lecture. Assignments must be completed via the Mastering Engineering web site before the posted due dates; partially completed assignments receive the score achieved before the due date.

- You are expected 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. The best approach is to have your solution book with you during lectures, labs, and tutorials.
- You may rework assignments after the due date for practice purposes; 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.

Exams

There will be one midterm exam and a final exam in this course. The midterm exam takes place during a lab period in the seventh week. The midterm will cover all topics covered up to the date of the exam. The three-hour final exam will take place during the exam period at the end of the term. The final exam is a closed book test where 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 labs are designed to help you prepare for this examination, so make sure you take full advantage of these exercises to prepare for the final.

For all exams, 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.

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.

Performance Requirements and Student Services

Student Responsibilities

As a student, it is your responsibility to contact the Office of the Registrar to complete the required forms, including the Withdraw Course or Program or a Change of Registration form. Please refer to the important dates listed in the Academic Schedule in the [Keyano College credit calendar](#). The Keyano College credit calendar also has information about Student Rights and the Code of Conduct. It is the responsibility of each student to be aware of the guidelines outlined in the Student Rights and the Code of Conduct Policies.

Student Attendance

Class attendance is helpful for two reasons: First, class attendance maximizes a student's learning experience. Second, attending class is an excellent way to keep informed of matters relating to the course administration (e.g., the timing of assignments and exams). Ultimately, you are responsible for your learning and performance in this course. It is the responsibility of each student to be prepared for all classes. Absent students are responsible for the material covered in those classes, and students must ensure they are ready for their next class, including completing any missed assignments and notes.

Academic Misconduct

Students are considered responsible adults and should adhere to the principles of intellectual integrity. Intellectual dishonesty takes many forms:

- Plagiarism or the submission of another person's work as their 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,
- Submitting unchanged work 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. To ensure your understanding of plagiarism, you may be required to complete the online [Understanding Plagiarism tutorial](#) and submit the certificate of completion.

Online Learning

Technology and internet connectivity will impact your online learning experience. You may be required to watch online videos, take online quizzes, or participate in live online classes. Live/virtual courses 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 access to the correct tools for online learning is essential. Here's a list of recommended system requirements.

Internet Speed

Minimum download and upload speeds of 10 Mbps. Recommended download speeds of 25 Mbps and upload speeds of 10 Mbps (if you are sharing your internet at home). You can check your internet speed with [Speedtest by Ookla](#).

Computer System Requirements

Microsoft Windows	Apple (Mac)
<p>Minimum Requirements:</p> <ol style="list-style-type: none"> Windows 10 Operating System or above 4GB of RAM 10GB available hard drive storage space <ol style="list-style-type: none"> Install the Microsoft Office 365 suite (~3GB) * Microphone, webcam, and speakers (All modern laptops have these three accessories built-in.) Windows has built-in anti-virus/malware software. It is essential to install system updates to keep your device secured regularly. <p>*Microsoft Office 365 is free to Keyano students.</p>	<p>Minimum Requirements:</p> <ol style="list-style-type: none"> Mac Operating System 10.14 (Monterey) or above 4GB of RAM 10GB available hard drive storage space <ol style="list-style-type: none"> Install the Microsoft Office 365 suite (~3GB) * Microphone, webcam, and speakers (All modern laptops have these three accessories built-in.) Mac has built-in anti-virus/malware software. It is important to install system updates to keep your device secured regularly. <p>*Microsoft office 365 is free to Keyano students.</p>
<p>Recommended Upgrades</p> <ul style="list-style-type: none"> 8GB of RAM Regularly back up or synchronize your files, locally or with a cloud-based storage option. <p>OneDrive is the cloud-based storage option free to students after the setup of KeyanoMail and Microsoft 365.</p>	<p>Recommended Upgrades</p> <ul style="list-style-type: none"> 8GB of RAM Regularly back up or synchronize your files locally or with a cloud-based storage option. <p>OneDrive is the cloud-based storage option free to students after the setup of KeyanoMail and Microsoft 365.</p>
<p>Tablets, iPads, and Chromebooks are not recommended: they may not be compatible with the testing lockdown browsers and Microsoft Office 365.</p>	

Specific Department Requirements

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

Computer Software

Students have access to Microsoft Office 365 and Read&Write for free using Keyano credentials.

Recording of Lectures and Intellectual Property

Students may only record a lecture if explicit permission is provided by the instructor or 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 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 have issues with your student account, you can contact the ITS Helpdesk by emailing its.helpdesk@keyano.ca or calling 780-791-4965.

COVID-19 We are subject to provincial, and municipal bylaws, and policies. These decisions may change pending further direction from the Alberta Chief Medical Officer, Alberta Health Services, and other provincial guidelines. To protect yourself and others, get immunized, wash your hands, wear a mask, keep your distance (2m/6 ft) and remain home when feeling unwell. For the most recent COVID-19 information, please refer to albertahealthservices.ca/COVID.

Specialized Supports The Student Services Department is committed to Keyano students and their academic success. There is a variety of student support available at Keyano. All student services are available during Keyano business hours: Monday to Friday, 8:30 a.m. to 4:30 p.m. The College is closed on statutory holidays. If you require support outside of regular business hours, please inform the support service team, and they will do their best to accommodate your needs.

Accessibility Services provides accommodations for students living with disabilities. Students with documented disabilities or who suspect a disability can meet with an Access Strategist to discuss their current learning barriers and possible accommodations. Students who have accessed accommodations in the past are encouraged to contact the department to request accommodations for the following semester. Please note that requesting accommodations is a process and requires time to arrange. Contact the department as soon as you know you may require accommodations. For accessibility supports and disability-based funding, please book an appointment by emailing us at: accessibility.services@keyano.ca.

Accessibility Services also provides individual and group learning strategy instruction for all students and technology training and support to enhance learning. You can meet with an Access Strategist to learn studying and test-taking strategies. In addition, you can 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 provide a safe and confidential environment for you to seek help with personal concerns. Our Wellness Navigator offers support with basic needs such as housing, financial and nutritional support, and outside referrals

when needed. Wellness Services welcomes students to participate in group sessions that address topics including mindfulness and test anxiety throughout the academic year. Individual appointments can be made by emailing wellness.services@keyano.ca.

Library Services: provides students with research, information, and education technology supports as they engage in their studies. Library staff are available to help you online and in person throughout the semester. Librarians offer individual and small group appointments booked using the online [Book A Librarian calendar](#). The Library also provides research and subject guides to help you with your studies. To view a subject or course-specific guide, check out the complete list of online [Subject Guides](#). To start your research and access citation guides (APA, MLA, Chicago, or IEEE), visit the [Research Help page](#). The Library's collections (including print and online materials) are searchable using [OneSearch](#). The Library offers a Loanable Technology collection to support students accessing and using technology. For an up-to-date list of technology available for borrowing, visit the Library's [Loanable Technology webpage](#). For a detailed list of library resources and services, go to www.keyano.ca/library. For all inquiries, please email askthelibrary@keyano.ca or [chat with us online](#).

Academic Success Centre: The Academic Success Centre at Keyano College (CC-119) provides **free** academic support services to registered students, such as tutoring, writing support, facilitated study groups, workshops, and study space. Academic Content Specialists are available in Mathematics, Science, Trades, Power Engineering, Upgrading/College Prep, Human Services, English, Humanities, and more. Students are encouraged to visit the Academic Success Centre to discuss study strategies and academic concerns. For additional information, please email Academic.Success@keyano.ca.

Academic Success Coach: The Academic Success Coach is located in the Academic Success Centre and works with students to develop academic success plans, time management skills, study strategies, and homework plans. For additional information, please email Academic.Success@keyano.ca.

Authorization

This course outline has been reviewed and approved by the Program Chair.

[First Name, Last Name], Instructor

[First Name, Last Name], Chair	Date Authorized
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[First Name, Last Name], Dean	Date Authorized
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Signed copies to be delivered to:
 Instructor
 Registrar's Office