

**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**

Robert Changirwa  
S211B  
(780) 791-4940  
robert.changirwa@keyano.ca

**Office Hours**

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

**Hours of Instruction**

Monday 14:00 – 15:50, Room CC239 (Tutorials)  
Tuesday 09:00 – 10:20, Room CC239  
Thursday 09:00 – 10:20, Room CC239

**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%
<b>TOTAL</b>	<b>100%</b>

*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 under Academic Misconduct).

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

**Please Note:**

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

## Performance Requirements

### 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.

More specific details are found in the Student Rights and Student 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 Student Code of Conduct Policies.

### Laboratory Safety

In the science laboratories, safety is important and therefore students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

Before entering the lab, students are responsible reviewing the lab manual and relevant Safety Data Sheets for the purpose of evaluating risks associated to health. Some hazards used in the laboratory may have additional risks to those with pre-existing medical conditions.

### Student Attendance

Class attendance is useful for two reasons. First, class attendance maximizes a students' 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 / or 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
- 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 Student 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 Student 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](http://ilearn.keyano.ca). Then print the certificate, sign it, and show it to each of your instructors. Your course work will not be graded until you show this signed certificate.

### Specialized Supports

The Student Academic Support Services (SASS) department: Accessibility Services, Skill Centre, Wellness Services and Student Life Department work together to support student success at Keyano College.

**Accessibility Services (CC167)** supports student success through group and individualized instruction of learning, study and test taking strategies, and adaptive technologies. Students with documented disabilities, or who suspect a disability, can meet with the Learning Strategists to discuss accommodation of the learning barriers that they may be experiencing. Students who have accessed accommodations in the past are encouraged to visit our office at their earliest opportunity to discuss the availability of accommodations in their current courses. Individual appointments can be made by calling 780-791-8934.

**Skill Centre (CC119)** provides a learning space where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff. Students visiting the centre have access to one-to-one or group tutoring, facilitated study groups, and assistance in academic writing. The Skill Centre's Peer Tutor program provides paid employment opportunities for students who have demonstrated academic success and want to share what they have learned. Tutoring is available free to any students registered at Keyano College on a drop in basis, from 8:30 am to 5:00 pm Monday through Friday. Additional evening hours are subject to tutor availability and are posted in the Skill Centre.

**Wellness Services (CC260)** 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. The Mindfulness Room in CC260 is available as a quiet space for students to relax during regular office hours. Wellness Service welcomes students to participate in any of the group sessions offered throughout the academic year addressing such topics as Mindfulness and Test Anxiety. Individual appointments can be made by calling 780-791-8934.

**Student Life Department (CC210)** is a place for students to go when they don't know who else can answer their questions. The staff will help students navigate barriers to success and if they don't know the answer, they will find it out. Student success is directly affected by how connected a student feels to their college. The student life department is there to help students get connected.

**Please watch your Keyano email for workshop announcements from our Student Academic Support Services team.**