

**Western University - Faculty of Engineering
Department of Civil and Environmental Engineering**

ES1022y – Engineering Statics - Course Outline 2023/24

This course introduces the principles of static equilibrium. The general objectives are for the student to become able to:

- identify, formulate, analyse, and solve engineering problems using the principles of static equilibrium;
- apply this knowledge to the analysis of two-dimensional trusses, frames and machines, internal forces within a beam, and impending motion of rigid bodies due to the effects of friction;
- apply calculus principles to determine the centroid of lines, areas, and volumes, and the moment of inertia of an area; and
- improve communication skills by documenting problem solutions in coherent and legible engineering calculations.

Calendar Copy:

Analysis of forces on structures and machines, including addition and resolution of forces and moments in two and three-dimensions. The application of the principles of equilibrium. Topics: trusses; frames; friction; and centroids. (0.5 course)

Prerequisites: None

Corequisites: None

Antirequisite: None

Note: It is the **student's responsibility** to ensure that all Prerequisite and Corequisite conditions are met or that special permission to waive these requirements has been granted by the Faculty. It is also the **student's responsibility** to ensure that they have not taken a course listed as an Antirequisite. The student may be dropped from the course or not given credit for the course towards their degree if they violate the Prerequisite, Corequisite, or Antirequisite conditions.

Course Format:

This course will be delivered **in person**.

“In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online at the discretion of the course instructor”

Contact Hours:

Two lecture hours/week; 2 tutorial hours every other week for 10 weeks each term - this is equivalent to 2 lecture hours/week and 1 tutorial hour/week over one term.

Attendance at the tutorial session is **mandatory**.

A 2-hour tutorial session (Part (A) of assignments) scheduled every other week as per the course timetable will be delivered in person (synchronously) through the *MasteringEngineering* platform.

A take-home assignment (Part (B) of assignments) will be delivered asynchronously every other week through the *MasteringEngineering* platform. Course Teaching Assistants (TAs) will hold weekly sessions for students seeking help with Part (B) of the assignment. The date/time of these help sessions will be posted weekly on the course site OWL.

Note: Review of lecture material and self-study should take approximately 6 hours per week.

Key Sessional Dates:

Fall term first day of classes: September 7, 2023

Winter term first day of classes: January 8, 2024

Fall reading week: October 30 – November 5, 2023

Spring reading week: February 17 – February 25, 2024

Fall term classes end: December 8, 2023

Winter term classes end: April 8, 2024

Midterm exam period: December 10 – 22, 2023

Final exam period: April 11 – 30, 2024

Instructors' contact information:**Fall Term**

Dr. Ayman El Ansary, P.Eng. : (section 001), office: SEB 3026A, email: aelansa@uwo.ca

Dr. Aiham Adawi, P.Eng. : (section 002), office: SEB 20, email: aadawi2@uwo.ca

Dr. Hassan El-Chabib, P.Eng. : (section 003), office: SEB 3029, email: helchab2@uwo.ca

Winter Term

Dr. Ayman El Ansary, P.Eng. : (section 001), office: SEB 3026A, email: aelansa@uwo.ca

Dr. Aiham Adawi, P.Eng. : (section 002), office: SEB 20, email: aadawi2@uwo.ca

Dr. Hassan El-Chabib, P.Eng. : (section 003), office: SEB 3029, email: helchab2@uwo.ca

Note: Any emails addressed to course instructors must have a subject line that includes the student's lecture section number and tutorial section number (e.g., Lec Sec. 001/Tut Sec. 004). Emails must be sent from a UWO email account. All email communication addressed to students will be sent to their UWO email account.

Textbook:

Engineering Mechanics: Statics, 15th Edition, by R.C. Hibbeler, published by Prentice Hall, packaged with *MasteringEngineering* access code (**required**)

Students will be advised on class notes by individual instructors.

Computing:

The course website can be found on OWL at <http://owl.uwo.ca/>, and should be checked on a regular basis for class notes, participation activities, notices about assignments, quizzes, midterms, and grades. Tutorial assignments, participation activities, quizzes, midterm, and the final exam will require the use of the *MasteringEngineering* platform which can be accessed at <http://www.masteringengineering.com/>. Registration on this website requires the use of an access code that can be purchased either packaged with the textbook or separately. An info session will be held during the first week of the Fall 2023 term to provide students with purchase options and instructions on how to use the *MasteringEngineering* platform.

Students are required to use computing devices (desktops, laptops, or tablets) capable of accessing the *MasteringEngineering* website during tutorials, quizzes, Midterm, and Final Exam.

Units:

Both SI and US Customary units will be used in lectures and examinations.

Specific Learning Objectives: [GA Indicator]

1. Statics of Particles
 - a) Apply parallelogram law of vector addition to forces [KB1, KB2]
 - b) Resolve forces in rectangular, cylindrical, and spherical coordinates [KB1, KB2]
 - c) Apply scalar and vector methods to calculate the resultant of concurrent forces [KB1, KB2]
 - d) Analyse a frictionless system of pulleys [KB1, PA2]
 - e) Calculate forces in elastic springs [KB1]
 - f) Solve equilibrium problems involving concurrent forces in 2D and 3D [KB2, PA2]
2. Statics of Rigid Bodies
 - a) Calculate the moment of a force about a point and about an axis [KB2, PA2]
 - b) Determine the resultant force/couple system at a given point in 2D and 3D [KB2, PA2]
 - c) Determine the resultant of a coplanar system of forces and couples [KB3, PA2]
 - d) Master procedure for drawing free-body diagrams [PA1]
 - e) Solve equilibrium problems in 2D with concentrated and distributed loading [KB3, PA2]
3. Trusses
 - a) Calculate tension and compression forces in members using the method of joints [KB3, PA2]
 - b) Calculate tension and compression forces in members using the method of sections [KB3, PA2]
 - c) Identify the zero-force members [KB3, PA1]

4. Frames and Machines
 - a) Recognize internal and external forces on pin-connected members [KB3, PA2]
 - b) Recognize two and three-force members [KB3]
 - c) Draw free-body diagrams of various components of frames and machines [PA1]
 - d) Solve equilibrium problems involving multi-component frames and machines [KB3, PA2]

5. Internal Forces
 - a) Calculate internal forces in members using the method of sections [KB3, PA2]
 - b) Draw shear force and bending moment diagrams [KB3, PA2]

6. Friction
 - a) Implement the theory of dry friction and the concept of impending motion in rigid body analysis [KB3]
 - b) Solve equilibrium problems involving wedges [KB3, PA2]

7. Centroid and Centre of Gravity
 - a) Apply calculus principles to determine the centroid of lines, areas, and volumes. [KB1]
 - b) Locate the centroid and center of gravity of composite bodies [KB3, PA2]

8. Moment of Inertia
 - a) Apply calculus principles to determine the moment of inertia of an area [KB1]
 - b) Calculate the moment of inertia of composite bodies using the parallel axis theorem [KB3, PA2]

Instructors may expand on material presented in the course as appropriate.

General Learning Objectives

E = Evaluate, T = Teach, I = Introduce

Knowledge Base	E	Engineering Tools		Impact on Society	
Problem Analysis	E	Teamwork		Ethics and Equity	
Investigation	I	Communication		Economics and Project Management	
Design		Professionalism		Life-Long Learning	

Evaluation:

The final course mark will be determined as follows:

Participation (Learning Catalytics):	10%
<i>MasteringEngineering</i> assignments:	10%
Quizzes:	20%
Midterm exam:	30%
Final exam:	30%
Total:	100%

- Note:
- (a) **To pass the course the sum of the student's grades in both the midterm and the final exam must be at least 50% of the total mark of the two exams combined. Students scoring less than 50%** will be assigned the aggregate mark, as determined above, or 48%, whichever is less.
 - (b) **Students who have failed this course previously must repeat all components of the course.** No special permissions will be granted enabling a student to retain laboratory, assignment, or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted.
 - (c) Should any of the quizzes conflicts with a religious holiday that a student wishes to observe, the student must inform the instructor of the conflict no later than two weeks before the scheduled test.

For further information on accommodations for religious holidays see

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Quizzes and Examinations:

Four quizzes will be given during tutorials throughout the year (two per term). The dates and times for these quizzes will be dependent on which tutorial section a student is enrolled in. Quizzes dates/times will be posted to the calendar on the course OWL site at the beginning of each term. A two-hour midterm examination will take place during the December 2023 examination period, while a two-hour final examination will take place during the April 2024 final examination period. **All quizzes and the midterm and final examinations are CLOSED BOOK and will be conducted through the *MasteringEngineering* platform.** Completion of this course will require you to have a device that meets the technical requirements for this service.

MasteringEngineering Assignments

Six coursework-related assignments will be given throughout the year using the *MasteringEngineering* tutorial and homework system (three per term). Late assignments will receive a grade based on the questions **completely** answered by the student at the time that the assignment is due. Extensions are to be negotiated with the course instructor, not the teaching assistants.

Participation

In-class participation marks will be assigned based on students' activities in completing *LearningCatalytics*, which is a classroom learning tool packaged with the *MasteringEngineering* online platform. Students will be informed on a weekly basis when such participation activities will be made available.

Use of English

In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests, and examinations for the improper use of English. Additionally, poorly written work with the exception of the final examination may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

Cheating:

University policy states that cheating is a scholastic offence. The commission of a scholastic offence is attended by academic penalties that might include expulsion from the program. If you are caught cheating, there will be no second warning.

For more information on scholastic offenses, please see:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_20

Attendance:

Any student who, in the opinion of the instructor, has not engaged sufficiently in class, laboratory, or tutorial periods will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular final examination in the course.

Accommodation and Accessibility:**Religious Accommodation**

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_10

Conduct:

Students are expected to arrive at lectures on time and to conduct themselves during class in a professional and respectful manner that is not disruptive to others. Please turn off your cell phone before coming to a class, tutorial, quiz, or exam. On the premises of the University or at a University-sponsored program, students must abide by the Student Code of Conduct:

<https://www.uwo.ca/univsec/pdf/board/code.pdf>

Sickness and Other Problems:

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

Assessments worth less than 10% of the overall course grade:*Participation (Learning Catalytics):*

For in-class participation activities, the **lowest participation grade in each term** will be dropped which means that students are allowed to miss up to two participation activities without the need to request for an academic consideration. Beyond that, any missed participation activity will receive no credit (zero grade.) Students with an approved academic consideration from the Dean's Office Academic Counselling unit (undergraduate services office), their missed in-class participation activities will be weighted according to the average grade calculated based on the student's participation in both Fall/Winter terms.

MasteringEngineering assignments:

For a student with an approved academic consideration from the Dean's Office Academic Counselling unit (undergraduate services office), if Part A of any of the in-tutorial assignments is missed, the student will be provided with an extension to work on this assignment as a take home similar to part B but within a 2 hrs time window.

Quizzes:

For a student with an approved academic consideration from the Dean's Office Academic Counselling unit (undergraduate services office), there is no make-up for a missed quiz.

However, the accommodation for a missed quiz will be as follows:

- **Fall term:** For students missing quizzes 1 and/or 2, the missed quiz grade will be reweighted to the December midterm exam.
- **Winter term:** For students missing quizzes 3 and/or 4, the missed quiz grade will be reweighted to April Final exam

Assessments worth 10% or more of the overall course grade:

For work totaling 10% or more of the final course grade (**midterm and final exam**), you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible.

Absences from midterm Examinations

If you miss the December midterm Exam, please contact Western Engineering Undergraduate Services as soon as possible. They will assess your eligibility to write a makeup exam during the month of January.

Absences from Final Examinations

If you miss the Final Exam, please contact Western Engineering Undergraduate Services as soon as possible. They will assess your eligibility to write the Special Examination.

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in a 23-hour period, more than 3 exams in a 47-hour period).

Notice:

All quizzes, midterm, and final examinations will be conducted through the *MasteringEngineering* online platform (proctored computer-based exams). Students will be given two attempts per submission in these computer-based assessments. Students will receive full credit for a correct answer on the first attempt. Students with an incorrect answer in the first attempt will have an opportunity for a second trial “attempt” which will be graded out of 60% of the question mark.

Completion of this course will require you to have a device that meets the technical requirements for this service.

Students are responsible for regularly checking their email, and course website (<https://owl.uwo.ca>).

Consultation:

Students are encouraged to discuss problems with their teaching assistant and/or the instructor in tutorial sessions. Office hours will be arranged for the students to meet with the instructor and teaching assistants. Other individual consultations can be arranged by appointment with the instructor.

Course breakdown:

50% Natural Science; 50% Engineering Science.

The document “INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED” is part of this course outline.

STATEMENT ON GENDER-BASED AND SEXUAL VIOLENCE

Western [is committed to reducing incidents of gender-based and sexual violence](#) and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, [here](#). To connect with a case manager or set up an appointment, please contact support@uwo.ca.

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

If, on medical or compassionate grounds, you are unable to write term tests or final examinations or complete course work by the due date, you should follow the instructions listed below. You should understand that academic relief will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services Office) that there are compelling medical or compassionate grounds that can be documented before academic relief will be considered. Different regulations apply to term tests, final examinations and late assignments. Please read the instructions carefully.

A. GENERAL REGULATIONS & PROCEDURES

1. All first-year students will report to the Undergraduate Services Office by submitting the [Academic Consideration Request Form](#), for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or examination you will report the absence by submitting [Academic Consideration Request Form](#). Absences worth LESS THAN 10% of your mark, will be processed by your department office. If your course work is worth 10% OR MORE of your final grade, your request will be processed by the Undergraduate Services Office.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM/MIDTERM TESTS

1. If you are in first year and you are unable to write a midterm/term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a midterm/term test, inform your instructor PRIOR to the scheduled date of the test and request relief through the [Academic Consideration Request Form](#). If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, your request for relief will be processed by your department office. If the test is worth MORE THAN 10% of your final grade your request for relief will be processed by the Undergraduate Services Office.
3. Be prepared to attach supporting documentation to the Department Chair and/or the Undergraduate Services Office through the online form (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. The approval of the Chair or the Undergraduate Services Office is required when rescheduling midterm/term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office **PRIOR TO THE SCHEDULED EXAMINATION TIME** to report your absence using the [Academic Consideration Request Form](#) and request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, headache, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must submit an "[Application for a Special Exam](#)" form. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to submit the [Academic Consideration Request Form](#) and provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
 - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.
 - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You are strongly encouraged to seek advice from your Academic Counsellor in the Undergraduate Services Office.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your Academic Counsellor.

Calendar References: Check these regulations in your 2023 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness:

https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_13_5

Academic Accommodations for Students with Disabilities:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_10

Academic Accommodations for Religious or Holy Days:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_16

Course Withdrawals:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=6&SelectedCalendar=Live&ArchiveID=#Page_75

Examinations:

<http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&command=showCategory&SelectedCalendar=Live&ArchiveID=#>

Scheduling of Term Assignments:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#SubHeading_78

Scholastic Offences:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#Page_20

Student Medical Certificate:

<https://www.eng.uwo.ca/files/undergraduate/student-medical-certificate.pdf>

Engineering Academic Regulations:

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=4&SelectedCalendar=Live&ArchiveID=#Page_86

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Add Deadlines:

First term half course (i.e. “A” or “F”)	September 15, 2023
Full courses and full-year half course (i.e. “E”, “Y” or no suffix)	September 15, 2023
Second term half course (i.e. “B” or “G”)	January 16, 2024

Drop Deadlines:

First term half course without penalty (i.e. “A” or “F”)	November 13, 2023
Full courses and full-year half courses without penalty (i.e. “E”, “Y” or no suffix)	November 30, 2023
Second term half or second term full course without penalty (i.e. “B” or “G”)	March 7, 2024

Contact Information:

Undergraduate Services Office:	SEB 2097 Phone: 519-661-2130	E-mail: engugrad@uwo.ca
Chemical & Green Process Engineering:	TEB 477 Phone: 519-661-2131	E-mail: cbeugrad@uwo.ca
Civil Engineering:	SEB 3005 Phone: 519-661-2139	E-mail: civil@uwo.ca
Computer, Electrical, Mechatronic Systems & Software Engineering	TEB 279 Phone: 519-661-3758	E-mail: ecceugrad@uwo.ca
Integrated Engineering	ACEB 2410 Phone: 519-661-6725	E-mail: engceli@uwo.ca
Mechanical Engineering:	SEB 3002 Phone: 519-661-4122	E-mail: mmeundergraduate@uwo.ca