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

ES1022y – Engineering Statics - Course Outline 2022/23

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:

2 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 zoom meetings for students seeking help with Part (B) of the assignment. The link to the zoom meeting and date/time of these help sessions will be posted weekly on course OWL.

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

- Key Sessional Dates:

  Classes begin: September 8, 2022; January 9, 2023
  Fall Reading Week: October 31 – November 6, 2022; February 18 – 26, 2023
  Classes end: December 8, 2022; April 10, 2023
  Exam period: December 10 – 22, 2022; April 13 – 30, 2023

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. Ayan Sadhu, P.Eng. : (section 003), office: SEB 3020, email: asadhu@uwo.ca

Administrative Support: Sandra McKay, SEB 3005

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. Ayan Sadhu, P.Eng. : (section 003), office: SEB 3020, email: asadhu@uwo.ca

Administrative Support: Sandra McKay, SEB 3005

Note: Any emails addressed to course instructors must have a subject line which includes 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:


Students will be advised on class notes by individual instructors.

Computing:

The course website can be found on OWL at [http://owl.uwo.ca/](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 final exam will require the use of the MasteringEngineering platform that can be accessed at [http://www.masteringengineering.com/](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 2022 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 resultant of concurrent forces [KB1, KB2]
   d) Analyse frictionless system of pulleys [KB1, PA2]
   e) Calculate forces in elastic springs [KB1]
   f) Solve equilibrium problems involving concurrent forces in 2D and 3D [KB3, 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, PA2]
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 concept of impending motion in rigid body analysis [KB2]
   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 centroid and centre 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**

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**Evaluation:**

The final course mark will be determined as follows:

- Participation (Learning Catalytics): 10%
- *MasteringEngineering* 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 conflict 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.uwo.ca/univsec/handbook/appeals/accommodation_religious.pdf

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 2022 final examination period, while a two-hour final examination will take place during the April 2023 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 penalised 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.uwo.ca/univsec/handbook/appeals/scholastic_discipline_undergrad.pdf

**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

**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:
https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf.

**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:
http://www.uwo.ca/univsec/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**: Students missing quizzes 1 and/or 2, the missed quiz grade will be reweighted to December midterm exam
- **Winter term**: 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. For further information, please consult the University’s medical illness policy at


The Student Medical Certificate is available at


Absences from midterm Examinations

If you miss 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 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 in the first attempt. Students with 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).

Academic Policies:
The website for Registration Services is http://www.registrar.uwo.ca.

In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual’s official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

List of approved “non-programmable” calculators is posted on the course site OWL. The models included in this list are the only calculators allowed for tutorials, quizzes, and exams.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

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 consultation 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.