

THE UNIVERSITY OF WESTERN ONTARIO
FACULTY OF ENGINEERING
DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

ES 1022y: Engineering Statics
Course Outline – 2009-2010

Prerequisite: None

Corequisite: None

Antirequisite: None

Course Description: 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 include trusses, frames, friction, and centroids.

Contact Hours

2 lecture hours and 1 tutorial hour every week.

Text

Required: *Engineering Mechanics: Statics*, 12th Ed., by R.C. Hibbeler, published by Prentice Hall, packaged with *MasteringEngineering* access code

Course Notes

To be advised by individual instructors

Course Website

Accessed using WebCT OWL (<http://webct.uwo.ca/>) with valid UWO student ID and password

Instructors:

Fall term

Section 001: Dr Ralph Baddour
Room 3079, Spencer Engineering Building (SEB3079)
E-mail: rbaddour@uwo.ca
Secretary: Civil Office, Room 3005, Spencer Engineering Building (SEB3005)

Section 002: Dr Craig Miller (course co-ordinator)
Room 110, Boundary Layer Wind Tunnel Laboratory (WT110)
E-mail: cam@blwtl.uwo.ca
Secretary: Civil Office, Room 3005, Spencer Engineering Building (SEB3005)

Winter term

Section 001: To be announced

Section 002: Dr Diana Inculet
Room 119, Boundary Layer Wind Tunnel Laboratory (WT119)
E-mail: dri@blwtl.uwo.ca
Secretary: Civil Office, Room 3005, Spencer Engineering Building (SEB3005)

Topics and Specific Learning Objectives

1. Statics of Particles

- a) Apply parallelogram law of vector addition to forces
- b) Resolve forces in rectangular, cylindrical and spherical coordinates
- c) Apply scalar and vector methods to calculate resultant of concurrent forces
- d) Analyze frictionless system of pulleys
- e) Calculate forces in elastic springs
- f) Solve equilibrium problems involving concurrent forces in 2D and 3D

2. Statics of Rigid Bodies

- a) Calculate the moment of a force about a point and about an axis
- b) Determine the resultant force/couple system at a given point in 2D and 3D
- c) Determine the resultant of a coplanar system of forces and couples
- d) Master procedure for drawing free-body diagrams
- e) Solve equilibrium problems in 2D with concentrated and distributed loading

3. Trusses

- a) Calculate tension and compression forces in members using the method of joints
- b) Calculate tension and compression forces in members using the method of sections
- c) Identify the zero-force members

4. Frames and Machines

- a) Recognize internal and external forces on pin-connected members
- b) Recognize two and three-force members
- c) Draw free-body diagrams of various components of frames and machines
- d) Solve equilibrium problems involving multi-component frames and machines

5. Internal Forces

- a) Calculate internal forces in members using the method of sections
- b) Draw shear force and bending moment diagrams

6. Friction

- a) Implement the theory of dry friction and concept of impending motion in rigid body analysis
- b) Solve equilibrium problems involving wedges

7. Centroid and Centre of Gravity

- a) Apply calculus principles to determine the centroid of lines, areas and volumes.
- b) Locate centroid and centre of gravity of composite bodies

8. Fluid Pressure

- a) Apply Pascal's Law to determine the resultant forces acting on an immersed body

Units

Both *SI* and *US Customary* unit systems are adopted in this course.

Assignments

A total of nine assignments will be given throughout the year using the *MasteringEngineering* tutorial and homework system (access code purchased packaged with textbook or separately). The nine assignments will consist of an assignment designed to introduce students to the *MasteringEngineering* system, and eight coursework related assignments (four per term). Further details on how to access the *MasteringEngineering* website and register for the course will be provided in class and posted to the course website.

Tests and Examinations

Tests and examinations are **Limited Open Book** (calculators of any kind are allowed, but external sources of information, including books, notes, and crib sheets are not allowed).

Evaluation

<i>MasteringEngineering</i> assignments	10.0%
Fall term test (October 24 th - 2:00 pm to 3:30 pm)	15.0%
Midterm exam (November 28 th – 9:30 am to 12:30 pm)	30.0%
Winter term test (February 27 th – 2:30 pm – 4:00 pm)	15.0%
Final exam (April exam period – date and time tba)	30.0%

A **student must pass the aggregate of the midterm and the final examination to pass the course**. A student who obtains less than 50% aggregate will be assigned a mark based on the distribution as determined above or 48%, whichever is less.

This course evaluation will only be altered if a student misses a pop quiz, test or midterm with supporting documentation

Cheating and Plagiarism

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

Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar). Plagiarism Checking: The University of Western Ontario uses software for plagiarism checking. Students may be required to submit their written work in electronic form for plagiarism checking. In addition, if any computer-marked multiple-choice tests and/or exams are given, software to check for unusual coincidences in answer patterns that may indicate cheating may be used.

Attendance

Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, 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 examination in the course.

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 improper use of English. Additionally, poorly written work with the exception of final examinations 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.

Consultation Hours

Students are encouraged to discuss problems with the teaching assistants and/or instructor during tutorial sessions. Other individual consultation may be arranged by appointment.

Sickness or Other Problems

Students should immediately consult with the instructor or Associate Dean of Undergraduate Affairs if they have any problems that could affect their performance in the course. Where appropriate the problems should be documented (see attached). The student should seek advice from the instructor or Associate Dean regarding how best to deal with the problem. Failure to notify the instructor or Associate Dean immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For Students Repeating an Engineering Course

Students who have failed an Engineering course (i.e. < 50%) 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 for grading by the student in subsequent years.

Note

- 1) Students are responsible for regularly checking their e-mail and notices posted outside the Student Liaison Office SEB2097 or on the bulletin board across from SEB 2100 regarding the course.
- 2) Students are also responsible for regularly checking the course website for information that may be posted there regarding the course.
- 3) The attached document *Instructions for students unable to write tests or examinations or submit assignments as scheduled* is part of this course outline.

CEAB Course Breakdown

Total = 50.8 AU's

Basic Science = 50%: 25.4 AU's; Engineering Science = 50%: 25.4 AU's

ES 1022y – 2009/2010

Winter Term Weekly Schedule Referenced to the Course Textbook¹

<u>Week²</u>	<u>Sections in Textbook</u>	<u>Topics</u>	<u>Problems³</u>
Jan. 4 – 8	6.1 – 6.2	Trusses (intro, method of joints)	
Jan. 11 – 15	6.3 6.4	Trusses (zero force members) Trusses (method of sections)	
Jan. 18 – 22	6.6	Frames and Machines	
Jan. 25 – 29	6.6	Frames and Machines (cont.)	
Feb. 1 – 5	7.1	Internal Forces	
Feb. 8 – 12	7.2 – 7.3	Shear and Moment Diagrams	
Feb. 15 – 19		Reading Week	
Feb. 22 – 26	8.1 – 8.2	Friction	

Term 2 Test **Saturday, Feb. 27/2010 – 2:30 pm - 4:00 pm**

Mar. 1 – 5	8.3, 8.5	Friction - Wedges, Flat Belts
Mar. 8 – 12	9.1 – 9.2 9.3	Centroids Composite Bodies
Mar. 15 – 19		No ES 1022y classes
Mar. 22 – 26	9.6	Fluid Pressure

¹ Hibbeler, "*Engineering Mechanics: Statics*", 12th Edition.

² Dates are an approximate guide for students and the lectures may not exactly follow this schedule.

³ Minimum suggested problems for students to work on a weekly basis. It is highly recommended when reviewing for tests and examinations to attempt more problems found in the textbook and previous year's examinations.

⁴ Indicates a week in which a *MasteringEngineering* assignment is due.



The University of Western Ontario
Faculty of Engineering
2009-2010

**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 ACCOMMODATION WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE IF YOU ARE IN FIRST YEAR) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC ACCOMMODATION WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2009 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. CHECK THE COURSE OUTLINE TO SEE IF THE INSTRUCTOR HAS A POLICY FOR MISSED TESTS, EXAMINATIONS, LATE ASSIGNMENTS OR ATTENDANCE.
2. BRING YOUR REQUEST FOR ACADEMIC ACCOMMODATION TO THE ATTENTION OF THE CHAIR OF YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE IF YOU ARE IN FIRST YEAR) PRIOR TO THE SCHEDULED TIME OF THE TEST OR FINAL EXAMINATION OR DUE DATE OF THE ASSIGNMENT. IF YOU ARE UNABLE TO CONTACT THE RELEVANT PERSON, LEAVE A MESSAGE WITH THE APPROPRIATE DEPARTMENT (OR WITH THE UNDERGRADUATE SERVICES OFFICE, IF YOU ARE IN FIRST YEAR). THE ADDRESSES, TELEPHONE AND FAX NUMBERS ARE GIVEN AT THE END OF THESE INSTRUCTIONS. DOCUMENTATION MUST BE PROVIDED AS SOON AS POSSIBLE.
3. 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 TESTS

1. If you are unable to write a term test, inform your instructor and the Chair of your Department (or the Undergraduate Services Office if you are in first year) prior to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office and inform the Chair of the Department (or the Undergraduate Services Office if you are in first year).
2. Be prepared to provide supporting documentation to the Chair and the Undergraduate Services Office (see next page for information on documentation).
3. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair (or the Undergraduate Services Office if you are in first year) is required when rescheduling 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 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 (please spell your full name).
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, 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 sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. 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 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 Associate Dean 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. 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.

SHORT ABSENCES

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

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 may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

DOCUMENTATION

If you consulted Student Health Services regarding your illness or personal problem, you should complete a Records Release Form in your Departmental Office (or in the Undergraduate Services Office if you are in first year). This form will be forwarded to Student Health Services who in turn will provide confirmation of the problem to the Department or Associate Dean as requested. At your request the Department (or Undergraduate Services Office if you are in first year) will send confirmation to your instructor(s).

If you were seen by an off-campus doctor, you must provide the doctor with a Student Medical Certificate to complete and then bring it to the Department (or the Undergraduate Services Office if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies, duration of absence.**

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).

ACADEMIC CONCERNS

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).

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.

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 2009 Western Academic Calendar:

Absences Due to Illness - page 25
Academic Accommodations for Disabled Students - page 26
Academic Accommodations for Religious or Holy Days - page 28
Course Withdrawals - pages 45-46
Debarred from Writing Examinations - page 38
Incomplete Standing - page 18
Scheduling of Term Assignments - page 39
Scholastic Offences - page 21-25
Special Examinations - page 37

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.

<u>Drop Deadlines:</u>	First term half course (i.e. "A" or "F"):	October 15, 2009
	Full courses and full-year half courses (i.e. "E", "Y" or no suffix):	November 30, 2009
	Second term half or second term full course (i.e. "B" or "G"):	February 12, 2010

Undergraduate Services Office:	SEB 2097 telephone: (519) 661-2130	fax: (519) 661-3757
Dept. of Chemical and Biochemical Engineering:	TEB 477 telephone: (519) 661-2131	fax: (519) 661-3498
Dept. of Civil and Environmental Engineering:	SEB 3005 telephone: (519) 661-2139	fax: (519) 661-3779
Dept. of Electrical and Computer Engineering:	TEB 279 telephone: (519) 661-3758	fax: (519) 850-2436
Dept. of Mechanical and Materials Engineering:	SEB 3002 telephone: (519) 661-2136	fax: (519) 661-3020