



**University of Manitoba**  
**Faculty of Engineering**  
**Department of Biosystems Engineering**

## COURSE DETAILS

---

<b>Course Title &amp; Number:</b>	Design of Structural Components in Machines, BIOE3400
<b>Number of Credit Hours:</b>	4
<b>Class Times &amp; Days of Week:</b>	11: 30-12:20 MWF
<b>Location for classes:</b>	n/a
<b>Lab/Tutorial Times &amp; Days of Week</b>	2:30-5:15 T
<b>Location for labs/tutorials:</b>	n/a
<b>Pre-Requisites:</b>	CIVL 2800 or MECH 2222

## Instructor Contact Information

---

**Instructor(s) Name:** Ying Chen  
**Preferred Form of Address:** Dr. Chen  
**Office Location:** E1 349, EITC  
**Office Hours or Availability:** Anytime by emails during working days  
**Cell Phone No.** 204-396-4861  
**Email:** ying.chen@umanitoba.ca

**TA Name:** Mary Ragasa  
**Preferred Form of Address:** Mary  
**Office Location:** n/a  
**Office Hours or Availability:** 2:30-5:15 pm, Th; other times by emails  
**Email:** ragasam@myumanitoba.ca

## Course Description

---

Design of structural components in machines; designing for axial tension and compression, connections for axial loadings, pinned trusses, bending, torsion, and combined loads; designing for welded connections; use of fluid power to enable movement of structural components. Students will use the computer as a design tool.

---

## General Course Information

---

This is a required course in the Biosystems Engineering program. This course is built upon on a prerequisite as mentioned above. Thus, it is intended that students take this course in the third year or fourth year.

---

## Course Goals

---

This course provides an introduction to the engineering design process by using calculations in the general area of structural mechanics and steel design. The primary objectives are:

1. To increase the student's ability to apply statics and mechanics of materials to engineering design problems.
2. To discuss the design of structural components as they occur in machines.
3. To provide an introduction to computer assisted design using interactive structural design tool.

---

## Intended Learning Outcomes

---

At the end of this course the student should have an understanding of:

1. How to design members subjected to axial tension, axial compression, and torsion loadings.
2. How to select the members in a steel truss.
3. How to design members subjected to bending including tapered beams and beams with top and bottom plates.
4. How to design members subjected to the combined loadings of axial tension and bending, axial compression and bending, and torsion and bending.
5. How to design welded and bolted connections.
6. How to use an interactive structural design computer program to analyse and design structural systems as they occur in machines.

On satisfactory completion of this course students will be able to:

1. master key ingredients for successful design and systematically integrate those ingredients;
2. design, select, and evaluate structural components of machines.

---

## Using Copyrighted Material

---

Please respect copyright. For more information, see the University's Copyright Office website at <http://umanitoba.ca/copyright/> or contact [um\\_copyright@umanitoba.ca](mailto:um_copyright@umanitoba.ca).

---

## Textbook, Readings, Materials

---

Textbook (to be posted in UM Learn chapter by chapter):

Designing Structural Components for Machines by Larry J. Segerlind; 2010. ISBN:1-892769-76-X; LCCN: 2010902792; ASABE order number: 801M0310; Textbook number 21.

---

## Class Communication

---

Please note that all communication between myself and you as a student must comply with the electronic communication with student policy ([http://umanitoba.ca/admin/governance/governing\\_documents/community/electronic\\_communication\\_with\\_students\\_policy.html](http://umanitoba.ca/admin/governance/governing_documents/community/electronic_communication_with_students_policy.html)). You are required to obtain and use your U of M email account for all communication between yourself and the university.

---

## Academic Integrity

---

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or term assignments is also subject to serious academic penalty. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation and duplicate submission.

---

## Students Accessibility Services

---

If you are a student with a disability, please contact SAS for academic accommodation supports and services such as note-taking, interpreting, assistive technology and exam accommodations. Students who have, or think they may have, a disability (e.g. mental illness, learning, medical, hearing, injury-related, visual) are invited to contact SAS to arrange a confidential consultation.

- *Student Accessibility Services* <http://umanitoba.ca/student/saa/accessibility/>
- 520 University Centre
- 204 474 7423; [Student\\_accessibility@umanitoba.ca](mailto:Student_accessibility@umanitoba.ca)

---

## Lecturing Method

---

- The **Asynchronous teaching** approach will be taken.
- Students are not expected to attend in real time.
- Lectures will be recorded using Cisco Webex in UMLearn.
- Students can watch the lecture video through Cisco Webex in UMLearn.
- Lecture notes will be uploaded in UMLearn.

- Lecture contents will follow the order of the textbook chapters described in the table below.
- Evaluation vs. content is also detailed in the table.
- Reading the textbook is an effective way to learn in this course.

Textbook chapter	Content	Evaluation		
		Assignment	Midterm	Final exam
1	Introduction: Structures and Machines	Assignment	Midterm	
2	Reviewing the Basics	Assignment		
3	Computer and Design	Assignment		
4	Designing for Axial Tension	Assignment		
5	Designing for Axial Compression	Assignment		
7	Designing for Pinned Trusses	Assignment		
8	Designing for Bending	Assignment		Final exam
9	Designing for Torsion	Assignment		
10	Designing for Combined loads: Axial and Bending	Assignment		
11	Designing for Combined loads: Torsion and Bending	Assignment		

## Lab/Tutorial Content and Schedule

---

- The **synchronous teaching** approach will be taken for labs/tutorials.
- Students are expected to attend in real time.
- Labs/tutorials happen in real time: Thursday 2:30pm – 5:15pm through Webex in UMLearn
- Evaluation vs content is detailed in the table.
- Students are provided with an Excel computer program, namely IDMS (Interactive Design of Machinery Structures)

Lab/Tutorial	Date		Evaluation
No lab	Sept 10		
1	Sept 17	Loading diagrams	Lab report
2	Sept 24	IDMS (Interactive Design of Machinery Structures) (an Excel program): Introduction and Section Properties	Lab report
3	Oct 1	IDMS: IDMS: Computer Structure Models	Lab report
4	Oct 8	Problem solving – Design for Tension	Lab report
5	Oct 15	IDMS: Beam Analysis and Design	Lab report
6	Oct 22	IDMS: Column Buckling Analysis	Lab report
Midterm	Oct 29		
7	Nov 5	IDMS: Truss Design	Lab report
Fall break	Nov 12		
8	Nov 19	IDMS: Plane Frame Systems	Lab report
9	Nov 26	IDMS: Plane Grid Systems	Lab report
10	Dec 3	Q and A	
11	Dec 10	Q and A	

## Course Evaluation Methods

---

The grade for this course will be based on the following:

Due Date:	Assessment Tool	Value of Final Grade
To be announced by Univ.	Final Exam (open book, open notes)	35%
2:30-4:30 pm; Thursday, Oct 29	Midterm exam (open book, open notes)	35%
Due after one week	Assignments and tutorial/lab reports	30%

## Assignment Descriptions and Grading Times

---

Assignment questions will be selected from the Problems after each Chapter of the textbook. Questions for lab reports will be made based on the lab contents. Midterm and Final exam are 2-

hour open-book exams. Exams will focus on major concepts and require calculations to solve the problems. Students can expect to receive their graded assignments, lab reports, and midterm within a week or two from submission.

### **Late or Missing Submission Policy**

---

There will be one week given to complete an assignment or report, unless specified otherwise. Assignments and lab reports submitted after the due date will be docked 10% per school day for the first three days, and submission after three days will receive a zero grade. Missed assignments will receive a zero grade. Each student is allowed to have one late submission of assignments or lab reports (but no later than 3 days). You are responsible to inform the TA, when you want to use this allowance. Students who miss the midterm examination and final exam without a valid reason will receive a zero grade. Students who miss the midterm with a valid reason will be reassigned for their final exam percentage to 70%.