

*Classes: 11:00 am – 12:20 pm Mondays and Wednesdays*  
*Room: PF 3160*

*Instructor: Prof. Mauricio Soto-Rubio*  
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*PF 4148*  
*Tel. 408.220.5507*  
*Office hours: Wednesdays 1:00 pm – 2 pm by appointment*

*TA: To be confirmed*  
*Office hours: To be confirmed*

*CACB student performance criteria (SPCs) met by the course:*  
*Primary: Structural Systems, Building Materials and Assemblies*  
*Secondary: Design Skills*

## **Introduction**

This course focuses on the fundamental principles that affect the structural behavior of buildings. Through lectures, exercises and hands on experiments, students will learn analytical techniques for measuring and evaluating the flow of forces through structural systems. They will also begin to appreciate the factors involved in choosing an appropriate structural system for their designs. Students will learn to consider the structural behavior of buildings as a fundamental factor in the design of architectural proposals.

## **Objectives**

- 1. To learn the fundamentals principles that affect the structural behavior of buildings.*
- 2. To learn analytical techniques to measure and evaluate the flow of forces through structural systems.*
- 3. To develop the ability to evaluate and determine the appropriateness of structural systems and materials.*
- 4. To understand the importance of considering the structural behavior of buildings in the design of architectural proposals.*

## **Teaching Approach**

The course is divided into two broad areas: Structural Analysis and Structural Design. Individual course topics are presented mainly through lectures. Weekly required readings, assignments, discussions of student work, and videos supplement the material presented in lectures.

## **Content:**

**Week 1 - September 7:** *Course Introduction*

**Week 2- September 12 & 14:** *Loads. Acting loads on buildings: Live loads, dead loads, wind loads, snow loads, earthquakes, and thermic loads. Static Fundamentals.*

**Week 3 - September 19 & 21:** Forces. Composition and decomposition of forces. Reduction of force systems. Static Equilibrium.

**Week 4 - September 26 & 28:** Free body diagram. Types of Restraints. Moment. Pair of forces.

**Week 5 - October 3 & 5:** Stability and Determination of Forces. Reaction forces in isostatic structures.

**Week 6 - October 10:** Thanksgiving Holiday  
**October 12:** Block week (no class)

**Week 7 October 17 & 19:** Reaction forces in isostatic structures (continued.)

**Week 8 October 24 & 26:** Internal forces. Shear and Moment diagrams.

**Week 9 October 31 & November 2:** Section Properties and allowable material capacity.

**Week 10 November 7 & 9:** Section Properties and allowable material capacity (continued)

**Week 11- November 14 & 16:** Vector Active (truss) behavior and Analysis.

**Week 12 - November 21 & 23:** Truss analysis. Method of joints. Method of sections.

**Week 13 - November 28 and 30:** Truss Analysis. Graphic method.

**Week 14 - December 5 and 7:** Course Review. Final Exam.

## Means of Evaluation

Students will be evaluated through group projects (40%), weekly quizzes on required readings and lectures (25%), a final exam (25%), and participation in class (10%). Quizzes and exams are closed book; however, 1 page of notes (front and back) is allowed. Quizzes must be completed in the first 15 minutes of lecture class. Therefore, attendance to lecture is required. Absences will not count towards administrative fail but students are responsible for any missed work. Missed quizzes and exams due to un-excused absences will receive no credit.

## Grading Scale

Final grades will be reported as letter grades, with the final grade calculated according to the 4-point range.

Grade	Grade Point Value	4-Point Range	Percent	Description
A+	4.00	4.00	95-100	Outstanding - evaluated by instructor
A	4.00	3.85-4.00	90-94.99	Excellent - superior performance showing comprehensive understanding of the subject matter
A-	3.70	3.50-3.84	85-89.99	Very good performance
B+	3.30	3.15-3.49	80-84.99	Good performance
B	3.00	2.85-3.14	75-79.99	Satisfactory performance
B-	2.70	2.50-2.84	70-74.99	Minimum pass for students in the Faculty of Graduate Studies
C+	2.30	2.15-2.49	65-69.99	All final grades below B- are indicative of failure at the graduate level and cannot be counted toward Faculty of Graduate Studies course requirements.

C	2.00	1.85-2.14	60-64.99	
C-	1.70	1.50-1.84	55-59.99	
D+	1.30	1.15-1.49	50-54.99	
D	1.00	0.50-1.14	45-49.99	
F	0.00	0-0.49	0-44.99	

Notes:

- A student who receives a "C+" or lower in any one course will be required to withdraw regardless of their grade point average (GPA) unless the program recommends otherwise. If the program permits the student to retake a failed course, the second grade will replace the initial grade in the calculation of the GPA, and both grades will appear on the transcript.

## Readings

Specific readings will be assigned for the course. A copy of any required reading not taken from the required course textbook will be made available on the D2L course website. It is expected that assigned readings will be completed prior to the beginning of class for the date they are assigned.

### Required textbooks:

Millais, Mallcom, Building Structures: From Concept to Design; Spon Press, Taylor & Francis Group: 2005, ISBN: 0415336236

### Recommended textbooks:

- Allen, Edward & Iano, Joseph, The Architect's Studio Companion, (2001, John Wiley & Sons, NY)
- Allen, Edward & Iano, Joseph, Fundamentals of Building Construction, (2003, John Wiley & Sons, NY)
- Ambrose, James, Building Structures, (1993, John Wiley & Sons, New York)
- Billington, David, The Tower & The Bridge, (1983, Princeton University Press, New Jersey)
- Ching, Francis D.K., Building Construction Illustrated, (1991, Van Nostrand Reinhold, New York)
- Ching, Francis D.K., Onouye, B. S., & Zuberbuhler, D., Building Structures Illustrated, Patterns, Systems, and Design, (2009, John Wiley & Sons, Hoboken, New Jersey)
- Deplazes, Andrea, Constructing Architecture, Materials Processes Structures, (2005, Birkhauser-Publishers, Basel, Boston, London)
- Engel, Heino, Structure Systems, (1997, Distributed Art Publishers, New York)
- Otto, Frei, & Rasch, Bodo, Finding Form, (1995, Edition Axel Menges)
- Salvadori, Mario, Why Buildings Stand Up, (2002, W. W. Norton & Co., New York)
- Salvadori, Mario, Why Buildings Fall Down, (2002, W. W. Norton & Co., New York)
- Schueller, Wolfgang., The Design of Building Structures, (1995, Prentice Hall, New Jersey)
- Wolfe, William S., Graphical Analysis, a text book on Graphic Statics, (1921, McGraw-Hill, NY)
- Zalewski, Waclaw & Allen, Edward, Shaping Structures Statics, (1998, John Wiley & Sons, NY)

-Canadian Wood Council, Wood Reference Handbook, (1991, Canadian Wood Council, Ontario, Canada)

-DETAIL, Review of Architecture, Glass Construction Manual, (1999, Birkhauser, Basel, Switzerland)

-DETAIL, Review of Architecture, Steel Construction Manual, (2000, Birkhauser, Basel, Switzerland)

## Course Website

D2L will be utilized as the primary communication tool for this course. The course website will contain updated information regarding both project and homework assignments as well as required and recommended readings and references. It is the responsibility of students to ensure that they are registered for the course and that their e-mail contact information is up-to-date with the university.

## Special Budgetary Requirements

There are no special budgetary requirements for this course.

### Notes:

1. Written work, term assignments and other course related work may only be submitted by e-mail if prior permission to do so has been obtained from the course instructor. Submissions must come from an official University of Calgary (ucalgary) email account.
2. Academic Accommodations. Students who require an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to their Instructor or the designated contact person in EVDS, Jennifer Taillefer ([jtaillef@ucalgary.ca](mailto:jtaillef@ucalgary.ca)). Students who require an accommodation unrelated to their coursework or the requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Vice-Provost (Student Experience). For additional information on support services and accommodations for students with disabilities, visit [www.ucalgary.ca/access/](http://www.ucalgary.ca/access/)
3. Plagiarism - Plagiarism involves submitting or presenting work in a course as if it were the student's own work done expressly for that particular course when, in fact, it is not. Most commonly plagiarism exists when:(a) the work submitted or presented was done, in whole or in part, by an individual other than the one submitting or presenting the work (this includes having another impersonate the student or otherwise substituting the work of another for one's own in an examination or test),(b) parts of the work are taken from another source without reference to the original author,(c) the whole work (e.g., an essay) is copied from another source, and/or,(d) a student submits or presents work in one course which has also been submitted in another course(although it may be completely original with that student) without the knowledge of or prior agreement of the instructor involved. While it is recognized that scholarly work often involves reference to the ideas, data and conclusions of other scholars, intellectual honesty requires that such references be explicitly and clearly noted. Plagiarism is an extremely serious academic offence. It is recognized that clause (d) does not prevent a graduate student incorporating work previously done by him or her in a thesis. Any suspicion of plagiarism will be reported to the Dean, and dealt with as per the regulations in the University of Calgary Graduate Calendar.
4. Information regarding the Freedom of Information and Protection of Privacy Act (<http://www.ucalgary.ca/secretariat/privacy>) and how this impacts the receipt and delivery of course material
5. Emergency Evacuation/Assembly Points (<http://www.ucalgary.ca/emergencyplan/assemblypoints>)
6. Safewalk information (<http://www.ucalgary.ca/security/safewalk>)
7. Contact Info for: Student Union (<https://www.su.ucalgary.ca/contact/>); Graduate Student representative(<http://www.ucalgary.ca/gsa/>) and Student Ombudsman's Office (<http://www.ucalgary.ca/ombuds/>).