

*Classes: 09:30 am – 12:30 pm Fridays  
Room: PF 2160*

*Instructor: Prof. Mauricio Soto-Rubio  
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PF 4181  
Tel. 408.220.5507  
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PF 4146  
Office hours: Tuesdays 12:30 pm – 2pm*

*CACB student performance criteria (SPCs) met by the course:  
Primary: B7 - Structural Systems, B11 - Building Materials and Assemblies  
Secondary: B1 - Design Skills*

## **Introduction**

This course explores different structural systems and materials commonly used in contemporary architecture. The course revisits some of the structural principles learned in Structures for Architects 1 and provides students with the analytical tools to evaluate the system's characteristics, behavior, and specific physical requirements. This course is part of the EVDS building technology sequence and it is designed to support Comprehensive Building Design Studios.

## **Objectives**

By the end of the course, the students should be able to:

- Understand structures as an integral part of any architectural project.
- Identify structural and non-structural components of buildings, their specific roles and physical requirements.
- To develop the ability to evaluate and determine the appropriateness of structural systems and materials.
- Interpret the different loads applied to a structure.
- Describe the factors affecting the choice of structural system in a project.

## **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 – January 15th:** Course Introduction. Type of Structural Systems. Structural Analysis vs. Structural Design.

**Week 2 – January 22nd:** Ground. Foundations. Retaining Walls.

**Week 3 – January 29th:** Reinforced Concrete Structures.

**Week 4 – February 5th:** Solid Armature. Monolithic Structures. Surface Active Structures.

**Week 5 – February 12th:** Steel Structures

**Week 6 – February 19th:** No class – Reading Week.

**Week 6 – February 26th:** Open Armature. Vector Active Structures. Trusses.

**Week 7 – March 4th:** Wood Structures

**Week 8 – March 11th:** Filigree Structures. Light Wood Framing

**Week 9 – March 18th:** Tensile, Lightweight and Deployable Structures.

**Week 10 – March 25th:** No class – Good Friday

**Week 11 - April 1st:** Final Case Study Analysis Presentation.

**Week 12 – April 8th:** Final Exam.

**Week 13 - April 15th:**

## **Means of Evaluation**

Students will be evaluated through group projects (40%), weekly quizzes on recommended 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 "B-" 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:

-Ching, Francis D.K., Onouye, B. S., & Zuberbuhler, D., Building Structures Illustrated, Patterns, Systems, and Design, (2009, John Wiley & Sons, Hoboken, New Jersey)

### 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)

- 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

DLS 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 (<http://www.su.ucalgary.ca/page/affordability-accessibility/contact>); Graduate Student representative (<http://www.ucalgary.ca/gsa/>) and Student Ombudsman's Office (<http://www.su.ucalgary.ca/page/quality-education/academic-services/student-rights>).