Environmental DESIGN

architecture + landscape architecture + planning

University of Calgary / Faculty of Environmental Design

Environmental Design 683 ***EVDS 683 H(3-0)***
Advanced Special Topics in Environmental Design
Gridshell and Tensile Membrane Structures Seminar ***Fall 2018***

Classes: *9:00 pm – 10:30 pm Mondays and Wednesdays*
Room: PF 4140

Instructor: *Prof. Mauricio Soto-Rubio*
mauricio.sotorubio@ucalgary.ca
PF 4148
Tel. 408.220.5507
Office hours: Wednesdays 2:00 pm – 3 pm by appointment

Introduction

This seminar explores the design of grid shell structures and tensile fabric structures. Through lectures and practical exercises, students learn basic design principles, become familiar with digital and physical form-finding techniques, understand detailing, manufacturing and installation procedures, as well as the potential and limitation of the different materials typically used in this type of constructions. In addition, this seminar includes the design and fabrication of a full-scale research pavilion to be built on campus. This exercise will allow students to work in scale 1 to 1, the handle construction materials directly, and develop a project all the way from its initial conceptual design to its final installation.

Objectives

1. To learn the fundamental principles related with the design, manufacturing, engineering, and installation of tensile membrane structures and grid-shell structures.
2. To understand the main applications of tensile membrane structures and grid-shell structures in contemporary architecture.
3. To develop the necessary skills to design tensile membrane structures and grid-shell structures, including digital and physical form-finding techniques.
4. To become familiar with contemporary materials commonly used in tensile membrane structures and grid-shell structures.

Teaching Approach

Course topics are presented mainly though lectures. Weekly required readings, discussions of student work, and videos supplement the material presented in lectures. In addition, students are required to individually develop an architectural project related with membrane structures in order to demonstrate their understanding of this kind of building technology.

Content:

***Week 1*- September 11**: Seminar Introduction. History of tensile membrane structures. History of grid-shell structures. Basic design principles. Introduction of design exercise.

September 12: Lecture by Andrew Kudless, Matsys on Gridshell Structures.

Week 2 - September 17: Physical form-finding
September 19: Physical form-finding

Week 3 - September 24: Digital form-finding.
September 26: Digital form-finding

Week 4 - October 1: Lecture on Detailing
October 3: First Design Review

Week 5 - October 8: *Thanksgiving (no class)*
October 10: Design Development

***Week 6* - October 15 & 17:** Block Week

Week 7 - October 22: *Lecture on* Fabrication and Installation / Deskcrits
October 24: Deployable tensile membrane structures.

Week 8 - October 29: Cable-Net Structures / Deskcrits
October 31: Design Development

Week 9 - November 5: Lecture on Materials
November 7: Second Design Review

Week 10 - November 12: Inflatable membrane structures.
November 14: Design Development

Week 11 - November 19: Design Development
November 21: Design Development

Week 12 - **November 26:** *Design Development*
November 28: Final review

Means of Evaluation

The seminar includes a design exercise to be developed individually. Desk Crits, class pin-ups, and presentations are the essential components of this seminar's evaluation. Since architecture is a visual medium, this means having new and thoughtful visual work (drawings, models) each class session. If the instructor comes to you for a desk crit and find you have no significant new visual work (a scribble in your sketch book does not count), we will move on to the next student. For desk crits of digital drawings and models, students should have a printout of the material at their desk ready to go at the time of the critique.

In addition, the seminar includes a design-build project to be developed as a group. Attendance

and participation in this exercise is mandatory.

The grading of the exercise will follow the following guidelines: Adequacy of overall form (10%), physical form-finding models (10%), details (10%), patterns (10%), Digital form-finding (10%), participation in the design and fabrication of the design-build project (50%).

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.

Recommended textbooks:

-Otto, Frei, & Rasch, Bodo, Finding Form, (1995, Edition Axel Menges)

-Otto, F. (2005). Frei Otto: complete works: lightweight construction, natural design. W. Nerdinger (Ed.). Birkhäuser.

-DETAIL, Review of Architecture, Plastics and Membranes Manual, (2010, 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. The Academic Accommodations Policy can be found at: http://www.ucalgary.ca/policies/files/policies/student-accommodation-policy_0.pdf. It is the students' responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodations and have not registered with Student Accessibility Services, please contact them at 403.220.6019. Students who have not registered with Student Accessibility Services are not eligible for formal academic accommodations.

   Accommodations on Protected Grounds other than Disability
   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 appropriate Associate Dean, Department Head or the department/faculty designated contact person. 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/. You are also required to discuss your needs with your instructor no later than fourteen (14) days after the start of this course.

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. Appeals: If a student has a concern about the course, academic matter, or a grade that they have been assigned, they must first communicate this concern with the instructor. If the concern cannot be resolved with the instructor, the student can proceed with an academic appeal, which normally begins with the Faculty: http://www.ucalgary.ca/provost/students/ombuds/appeals

5. 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

6. Emergency Evacuation/Assembly Points (http://www.ucalgary.ca/emergencyplan/assemblypoints)

7. Safewalk information (http://www.ucalgary.ca/security/safewalk)

8. 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).