

**BUILDING SCIENCE & TECHNOLOGY I**  
**EVDA 511/ARST 449 H(3-0)**  
**Winter 2011**

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**Description:**

Function of the building enclosure: demonstration of the behaviour of building elements and their sub-assemblies under differential temperature and pressure stresses; fundamentals of acoustics; nature and use of building materials; response of building materials to climatic cycles radiation, precipitation, heating and cooling.

Credit for both EVDA 511 and Architectural Studies 449 will not be allowed.

**Introduction:**

This course is an introduction to building science principles and properties of materials. It will enable students to recognise factors which affect the performance of the building enclosure, and predict the probable service life of assemblies.

The course stresses an understanding of building elements and their sub-assemblies under absolute and differential temperature and pressure stresses, and hygrometric conditions. The course deals with the functions of building enclosures, occupant comfort and building materials. Design principles for optimizing lighting, acoustics, indoor air quality and thermal comfort are presented in the form of case studies and best practices.

Students engage in several assignments focused on the design and analysis of existing and proposed building assemblies.

**Objectives**

1. Introduction to principles of building science and its importance to contemporary practice.
2. To acquire a basic understanding of building enclosures as environmental barriers.
3. To understand the behaviour of building elements and their assemblies under differential temperature and pressure stresses.
4. To acquire an understanding of the functions, properties, costs, durability, availability and visual performance of materials.
5. To develop the capacity to understand the responses of building materials to climatic cycles – radiation, precipitation, heating and cooling through a systematic analysis of various assemblies in differing contexts.
6. To understand the implication of building regulations and codes governing the selection and arrangement of building materials.

## Contents

### Topics Covered:

Building Regulations, Functions of the Building Enclosure, Design and Service Life, Environmental Conditions, Human Comfort, Indoor Air Quality, Architectural Acoustics, Air Flow (Fluid Dynamics), Thermal Conditioning, Material Properties, Wall/Roof/Window/Enclosure Design Principles, Water and the Building Envelope, Tectonics, Contemporary Design Practices.

### Course Schedule (Subject to Change)

Tuesday	Thursday
1/10 Course Introduction Assign Tectonics Assignment	1/12 Building Enclosures
1/17 Environmental Conditions (Detail Presentation 01)	1/19 Life Cycle Analysis and Principles
1/24 Thermal Comfort	1/26 Interior Air Quality
1/31 Air Flow, Stack Effect	2/2 Thermal Considerations for Design (Detail Presentation 02)
2/7 Water (Cycles and effects)	2/9 Conditioning - Ephemeral Materiality in Architecture
2/14 Principles for Insulation	2/16 Properties of Materials (Exterior Finishes) (Detail Presentation 03)
2/21 BLOCK WEEK NO CLASS	2/23 BLOCK WEEK NO CLASS
2/28 Principles of Acoustics	3/1 Acoustics Analysis Assign Acoustics Assignment
3/6 Properties of Materials: Concrete	3/8 Properties of Materials: Wood
3/15 Wall Design Principles Part 1	3/17 Wall Design Principles Part 2

3/20 Windows/Openings Design Principles	3/22 Roof Design Principles
3/27 Failure/Liability & the Architect's Responsibilities	3/29 No Class (Field Trip).
4/3 Class Presentations Tectonics Assignment	4/5 Class Presentations Cont.
4/10 Class Presentations Cont.	4/12 Final Exam Review Session

\* Final Exam will be held during Final Examination Time as assigned by the Registrar.

### Teaching Approach

This course will be delivered as a series of lectures by a team of faculty members. Lectures will make extensive use of diagrams, illustrations and slides. In general case studies and research expertise will be presented to illustrate building science design principles.

Students will make a number of presentations in the course and submit a number of assignments related to the course content. Students will be asked to work in groups on several of the assignments.

Students are expected to devote at least nine hours per week for readings and preparing the assignments. Please refer to the Academic Calendar for details regarding academic misconduct.

### Readings/Resources

*Canadian Building Digest*, Institute for Research in Construction, National Research Council. Volumes 1-100, 101-150, 151-200, 201-250. (\$85.00 or free download from: <http://www.nrc.ca/irc/cbd/cbd-e.html>)

Other readings TBD.

Additional readings will be held in reserve at the EVDS front desk for check out by students.

### Means of Evaluation

1) Team Project 1: Acoustics	20%
2) Team Project 2: Tectonic Design/Analysis/Evaluation Project	35%
3) In-class Detail Presentations	5%
3) Final Exam (Registrar-scheduled final exam)	40%

Total 100%

**Textbook:** None assigned.

**Special Budgetary Requirements:** 0

**Notes:**

1. Written work, term assignments and other course related work may only be submitted by e-mail.

2. It is the student's responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodation and have not registered with the Disability Resource Centre, please contact their office at 220-8237. Students who have not registered with the Disability Resource Centre are not eligible for formal academic accommodation. 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. 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/affordabilityaccessibility/su-structure/contact-info>);  
Graduate Student representative (<http://www.ucalgary.ca/gsa/>)  
Student Ombudsman's Office  
(<http://www.su.ucalgary.ca/page/quality-education/academic-services/student-rights>).