

## Senior Research Studio in Architecture

EVDA 782.05

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TA: TBA

F(0-16) Winter 2016

## Responsive Architecture

### Introduction:

Senior Research Studio in Architecture is a research design studio in which students collaborate with design faculty in exploring projects that engage contemporary issues defining the built and natural environments. Students choose topics outlined by faculty research expertise.

EVDA 782.07 Section of the Senior Research Studio in Architecture will focus on adaptive and responsive architecture and will explore a territory beyond the stasis in architecture. The aim to develop responsive (building) systems/components is grounded in a position that the built world should operate synergistically within larger ecologies. In return, the responsive building systems could act as ecologies in themselves. The development of innovative solutions for adaptive, responsive buildings requires collaborative expertise from several disciplines, including computer science, biology, engineering, mechatronics, and material science. This course will involve students with different disciplinary backgrounds in order to explore how the interdisciplinary educational environment can foster richer educational experience that leads to innovation.

### Objectives:

1. To expand the understanding of the responsive systems and their role in architecture.
2. To engage broader social and technological issues triggered by the deployment of responsive systems.
3. To foster interdisciplinary crosspollination and collaboration.

Skills/Knowledge: Arduino platform, mechatronics, robotics, prototyping, applied design, design process.

### Teaching Approach:

In this design studio course students are expected to develop their design project in response to a design studio brief articulated by the instructor. Students develop weekly and in iterative fashion drawings, diagrams, written observations, and physical and digital models that illustrate their ideas and help them develop their projects. Over the course of the semester these take form of a design proposal and illustrate the design process students followed in the development of the project. Student projects will be discussed during desk crits, informal and formal reviews. Short lectures will be given throughout the semester, and discussions of various issues arising from the project will be conducted. The work will be conducted in interdisciplinary teams. The key component of the studio is that each team will build a physical prototype that demonstrates responsiveness of the designed architectural system. The prototypes represent proof of concept and they are at the core of the interdisciplinary collaboration envisioned for the studio. The process of developing these prototypes is where different disciplinary concepts would overlap, resulting in creative intersections. The emphasis will be placed on creating a speculative yet rigorous environment for creative exploration.

## Content:

As the external socio-economic, cultural, and technological context changes, so do conceptions of space, shape, form and performance in architecture. Over the past decade, we have seen an increasing interest in exploring the capacity of built spaces to respond dynamically to changes in the external and internal environments. The idea that two-way relationships could be established among the space/component/surface, the environment, and the users is not new. The first concepts of an adaptive, responsive architecture were born in the late 1960s and early 1970s, primarily as a result of parallel developments in cybernetics, artificial intelligence, and information technologies. This studio is interested in the territory where the cybernetics and architecture meet. New digital technologies of modeling, fabrication and simulation, new materials and material technologies, and responsive architecture informed by mechatronics and robotics have an extensive impact on the way we build and imagine architecture. Responsive Architecture studio reflects the importance of those new technologies in contemporary design.

Students will research the following topics and apply aspects of the research to their design projects:

1. Overview of the history of responsive architecture
2. Cultural and social impact of the interactive technology
3. Dynamic structures in Nature
4. Imbedded systems
5. New materials and material systems
6. From prototype to an architectural proposal

## Schedule:

Jan 11	Introductory lecture/ First assignment presentation
Jan 15	Desk Crit
Jan 19	Desk Crit
Jan 22	Desk Crit (research question due at the time of a desk crit)
Jan 26	Desk Crit (one paragraph project description due at the time of the desk crit)
Jan 29	In class review of projects
Feb 02	Desk Crit
Feb 05	Desk Crit
Feb 09	Desk Crit (research problem statement and methods due at the time of the desk crit)
Feb 12	Review (outside reviewers) Architectural proposal phase I completed
Feb 16	BLOCK WEEK
Feb 19	BLOCK WEEK
Feb 23	Desk Crit
Feb 26	Desk Crit (draft of the research studio summary report, hard copy)
Mar 01	Desk Crit
Mar 04	In class review of projects
Mar 04	Desk Crit
Mar 07	Desk Crit (research problem statement revised due at the time of desk crit)

Mar 08	Desk Crit
Mar 11	Desk Crit (introduction to topic revised due at the time of desk crit)
Mar 15	Desk Crit
Mar 18	Desk Crit (research through design revised due at the time of desk crit)
Mar 22	Desk Crit
Mar 25	Statutory Holiday - Good Friday
Apr 29	Review (outside reviewers)
Apr 01	Desk Crit
Apr 05	Desk Crit (summary and lessons learned due at the time of desk crit)
Apr 08	Desk Crit
Apr 12	Desk Crit (presentation mock up due)
Apr 15	Desk Crit
Apr 19	Desk Crit

Final Review To be announced

### Means of Evaluation:

The course evaluation will be based on assignments completed during the term. Both phases of the project include prototype development and architectural proposal.

Architectural proposal and prototype phase I	40%
Architectural proposal and prototype phase II	60%

Each project phase will be evaluated based on the following criteria:

1. Focus (25% of the grade) – ability to articulate Idea/Focus/Agenda/Position, and state it with conviction, clarity and intent, and to develop an effective argument through a design project.
2. Research (15% of the grade) – ability to do extensive research and to synthesize the research into new ideas, information, and insights that informed design decisions.
3. Design (35% of the grade) – ability for design thinking through generative drawings and models that explain, support and document design proposal development/ process.
4. Organization and Documentation (25% of the grade) – ability to clearly organize their argument with ideas flowing. Student demonstrates ability to organize and relate disparate design information and to support it effectively through visual means.

The EVDS standard grading scale will be used in all evaluations for this course.

A+ (95-100), A (90-94.99), A- (85-89.99), B+ (80-84.99), B (75-79.99), B- (70-74.99), C+ (65-69.99), C (60-64.99), C- (55-59.99), D+ (50-54.99), D (45-49.99), F (0-44.99)

### Readings:

Books:

Neeraj Bhatia and Lola Sheppard, *Bracket--Goes Soft--Almanac 2*

Michael Weinstock, *The Architecture of Emergence*  
Beesley Philip, *Responsive Architectures: Subtle Technologies 2006*  
Saarah Bonnemaïson and Christine Macy, *Responsive Textile Environments*  
David Benjamin + Soon-in Yang, *Life Size*  
Michael Fox and Miles Kemp, *Interactive Architecture*  
Robert Kronenburg, *Flexible: Architecture that Responds to Change*  
Bullivant Lucy, *4dsocial: Interactive Design Environments*  
Bullivant Lucy, *4dspace: Interactive Architecture*

#### Web Sources:

[http://www.ted.com/talks/rachel\\_armstrong\\_architecture\\_that\\_repairs\\_itself.html](http://www.ted.com/talks/rachel_armstrong_architecture_that_repairs_itself.html)  
[http://www.youtube.com/watch?v=Vps\\_\\_XdjZTk](http://www.youtube.com/watch?v=Vps__XdjZTk)  
<http://www.youtube.com/watch?v=kXPWih97w-4&NR=1>  
<http://www.youtube.com/watch?v=gNEILvRqQ5w&NR=1>  
<http://www.youtube.com/watch?v=SDInSy2C2NA>  
<http://www.thelivingnewyork.com/>  
<http://caad-eap.blogspot.com/>  
[http://www.sciarc.edu/sciarc\\_player.html?vid=http://www.sciarclive.com/Lectures/2010\\_09\\_29\\_DavidBenjamin.flv&title=David Benjamin](http://www.sciarc.edu/sciarc_player.html?vid=http://www.sciarclive.com/Lectures/2010_09_29_DavidBenjamin.flv&title=David Benjamin)

Other texts might be suggested throughout the semester

#### Special Budgetary Requirements:

EVDA 782 - Senior Arch. Studio (all sections)      \$100.00

#### 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.
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/affordability-accessibility/su-structure/contact-info>); 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>).

8. Students will be expected to complete each of the course assignments. There will be no final exam. Students must obtain an overall passing grade to pass this course, however, if a student fails any phase of the course worth 30% or more they will fail the course.

9. At the discretion of the instructor, assignments submitted after the deadline **may** be penalized with the loss of a grade (e.g.: A- to B+) for each day late. The following equivalencies (the University of Calgary has no official percentage scale system) will be used in calculating grades: **A+** (95.0-100.0); **A** (90.0-94.99); **A-** (85-89.99); **B+** (80.0-84.99); **B** (75.0-79.99); **B-** (70.0-74.99); **C+** (65.0-69.99); **C** (60.0-64.99); **C-** (55.0-59.99); **D+** (50.0-55.99); **D** (45.0-49.99); **F** (0-44.99).

10. 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. Final grades will be reported as letter grades, with the final grade calculated according to a 4-point range. Assignments will be evaluated by percentage grades with their letter grade equivalents as shown.

11. 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/)