Biomimicry and Bioart

Course Catalog: Designers, engineers and artists are beginning to use biologically inspired or biologically derived materials for solving a variety of world issues – from self-cooling buildings inspired by beehives to sticky tape inspired by geckos feet to DNA origami. This has now influenced a variety of fields such as architecture, technology, visual art and fashion design. This course will provide a broad framework of such design principles in use and allow students to create their own biologically inspired designs.

Objectives: This course is a Connections with a focus on how technology, science art and design come together to create a new field. Through detailed discussions of primary and secondary sources and a variety of assignments, students will develop analytical skills and learn how biology can inspire functional technology, fashion and architecture. Students will be encouraged to think critically about sources of information and to engage in short written assignments and presentations to improve their communication skills. Students will develop their understanding of the interrelationship of fields of knowledge by exploring connections and contrasts between various disciplines with respect to disciplinary methodology and subject matter.

Required readings:

The Gecko's Foot: Bio-inspiration: Engineering New Materials from Nature
by Peter Forbes (Author)

Assignments and Grading:

Blogs: Students will maintain weekly blogs where they will write about biologically inspired design or challenges that use biological medium to solve them. Each student will comment on the work of at least two other students each week. All blogs must have proper references, be written astutely and intelligently and have a specific style. Pictures with references will be included.

Readings and Group Discussions: Each class we will come prepared with the readings for the class and have formulated a written opinion about the work. These will form as discussion questions, which students will lead.

Assignments: Every week, students will be given a prompt that they will use to formulate an idea. We will identify a problem, create a design around it and write about it. These assignments will help you to learn fundamental aspects of scholarly writing and communication and will build off of one another, providing us with a common language for evaluating source materials, marshaling evidence for constructing and defending thesis statements, and writing a scholarly essay.

Final Proposals: The final report will be a proposal to build a prototype of a biomimicry based system that can solve a certain problem. The proposal should talk about the problem, precedence and how the solution will be achieved. Students will work in groups
**Tentative Schedule:**

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>READINGS</th>
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<tbody>
<tr>
<td>Week1</td>
<td>Aug 30/Sept 1</td>
<td>Introduction to Two Cultures (Science/Art) and the emerging Third Culture + Biomimicry</td>
<td>CP Snow “Two Cultures” <a href="http://www.nature.com/polopoly_fs/1.19188!/menu/main/topColumns/topLeftColumn/pdf/529277a.pdf">http://www.nature.com/polopoly_fs/1.19188!/menu/main/topColumns/topLeftColumn/pdf/529277a.pdf</a></td>
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**Activity 1:** Visit with Science librarian and media people. How to search for sources; how to build a blog.  
**Blog 1:** What is your perception of Biomimicry? Why do you think it is important? What do you think of as useful biomemtics?

Reading: Chapter 1 of Gecko |

**Blog 2:** Pick an animal or plant that you most identify with. What quality of that animal or plant would you most like to emulate/have?  
**Activity 2:** Walk around campus. Identify natural objects that you think have good design/function.

**Assignment 1:** Write about the natural object you found. Why do you think it has good form/function? What are its strengths weaknesses? What makes it that way?

|--------|------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
Blog 3: What would your genetically modified food look like? Create a label for your genetically modified/3D printed food.

Activity 3: How would you build something that would give you the quality of the animal/plant you wrote about? What would it look like?

Assignment 2: Identifying the problem: Write about a problem around you (big or small) that needs creative solutions. What are the ways in which it is being solved right now?

Hox Zodiac Dinner

<table>
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<tr>
<th>Week 4</th>
<th>Sept 20/22</th>
<th>Biomaterials</th>
<th><a href="http://www.wired.co.uk/news/archive/2013-08/16/biomaterial-revolution">http://www.wired.co.uk/news/archive/2013-08/16/biomaterial-revolution</a></th>
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<td></td>
<td></td>
<td>Chapter 2 and 3 of Geckos Foot</td>
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Blog 4: What part of your body are you most fascinated by? Why? Do you know how that part senses? Do you know how it reacts to the environment? For 1 week, record all the different ways you use this part of your body. Record the sensations it receives, the perception and when you become ‘unconscious of it’.

Assignment 3: Precedence: Going back to problems identified – what solutions have been tried. Talk about 1 in depth.

<table>
<thead>
<tr>
<th>Week 5</th>
<th>Sept 27/29</th>
<th>Genetics And Art</th>
<th>Chapter 8 of Geckos foot</th>
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Blog 5: If you were a chimeric animal, what would you look like? How would you interact with the world with these new inputs? What would you lose from your current world? Would your food change? Would the way you interact with objects change? What would the world look like?

Assignment 4: Precedence: Going back to problems identified – Is the solution you discussed perfect? What is wrong with it? How can it be improved? What are the barriers to improvement?

Week 6 | Oct 4/6 | Perspective | Chapter 4 of Geckos Foot |
| Week7 | Oct 11/13 | MID TERM | Pick an animal/insect/plant/microbe. They occupy the same environment as us, but live in a completely different world because of their size, their sense organs and their motivations. Conceptualize the organisms world from its point of view. You will submit a 2 page report (single spaced) that will contain a concept (5 lines), precedent (earlier work with references on similar themes), the organism you picked and its sense of perception and finally how that shapes the world around. Represent your concept using a design.

You will prepare a 5 minute presentation detailing your concept and design. |
|---|---|---|---|
| Week8 | Oct 20 | Architecture | http://www.core77.com/blog/videos/sculptor_bobby_jaber_walter_white_meets_buckminster_fuller_25385.asp
Chapter 6 of Geckos Foot |
| **Blog 6:** Pick a biomimicry based design – textile/algorithm/building that you think is cool. Why? Talk about it.
**Assignment 5:** Look at the new challenge put forth by the biomimicry institute. How will you tackle this challenge? What will you look towards for inspiration?
**Field trip to Bulleit Building:** [http://www.bullittcenter.org/visit/](http://www.bullittcenter.org/visit/) |
Chapter 10 of Geckos Foot |
| **Assignment 6/Blog 7:** You are putting together a kickstarter campaign to fund this project. Create a webpage or animation or schematic for this. Start researching precedence, |
| Week10 | Nov 1/3 | Bio-mechanics and robotics | http://vimeo.com/58293017
http://www.squidoo.com/H-R-Giger |
| **Assignment 6/Blog 8: Continued:** You are putting together a kickstarter campaign to fund your pet project. Create a webpage or animation or schematic for this. What will be your design, what are the benefits, final products of your work? |
### Evaluation Components:

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<thead>
<tr>
<th>Component</th>
<th>Grade</th>
<th>Points</th>
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<tbody>
<tr>
<td>Blogs</td>
<td>8 x 5</td>
<td>40</td>
</tr>
<tr>
<td>Assignments</td>
<td>5 x 10</td>
<td>50</td>
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<tr>
<td>Kickstarter assignment</td>
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<td>20</td>
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<tr>
<td>Midterm Proposal</td>
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<td>10</td>
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<tr>
<td>Midterm Presentation</td>
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<td>10</td>
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http://ecosalon.com/20_unforgettable_works_of_environmental_art/
Chapter 7 of Geckos Foot

**Editing/Final touches to website. What do you expect outcomes to be?**

*Design and build your prototype.*

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<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Details</th>
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<tbody>
<tr>
<td>12</td>
<td>Nov 17th</td>
<td>Ethics</td>
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<tr>
<td>13</td>
<td>Nov 22/29</td>
<td>Prototypes for final projects</td>
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http://challenge.biomimicry.org/


**Entries to the Food Systems challenge must:**

- Identify and solve a specific problem within the food system.
- Intentionally emulate one or more mechanisms, processes, patterns, or systems found in nature.
- Enhance the sustainability of the food system, whether from an environmental, social, or economic perspective—or ideally all three.

What you choose to focus on within the broad category of the "Food System" is up to you, but your team should narrow this broad challenge into a specific design problem—one with potential for impact and at a scope and scale that is feasible for your team.

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<th>Week</th>
<th>Date</th>
<th>Details</th>
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<td>15</td>
<td>December 7th</td>
<td>Art Sci Salon Installations?</td>
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**Panel critiques for proposals**

Dec 1/6

Student presentations of final work
Final Project Prototype Building 40 points
Final Presentation/Installation/Webpage 20 points
Class participation/blog comments/critiques 10 points

Names & Pronouns
I want to call you by what you consider your name, no matter what the official roster might tell me. Similarly, I want to honor your pronouns. Please inform me how you want me to refer to you, and please keep me informed if your pronouns change.

Academic Honesty: All materials that you present in this course as your work must be the product of your own efforts. It is not honest to treat or represent work as if one were fully responsible for it when it is, in fact, the work of another person or work in which one received unacknowledged assistance. Therefore, you should not receive outside help except from a tutor at the Center for Writing, Learning, and Teaching or instructors of the course. We will enforce all rules pertaining to Academic Honesty as outlined in The Logger. http://www.pugetsound.edu/student-life/student-handbook/academic-handbook/academic-integrity/

Bereavement Policy
Upon approval from the Dean of Students' Office, students who experience a death in the family, including parent, grandparent, sibling, or persons living in the same household, are allowed three consecutive weekdays of excused absences, as negotiated with the Dean of Students. For more information, please see the Academic Handbook.

Accessibility and Accommodation
If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Peggy Perno, Director of the Office of Accessibility and Accommodation, 105 Howarth, 253.879.3395. She will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Please notify me well in advance should you require accommodation in the class or lab.

Emergency Response Procedures
Please review university emergency preparedness and response procedures posted at www.pugetsound.edu/emergency/. There is a link on the university home page. Familiarize yourself with hall exit doors and the designated gathering area for your class and laboratory buildings.

If building evacuation becomes necessary (e.g. earthquake), meet your instructor at the designated gathering area so she/he can account for your
presence. Then wait for further instructions. Do not return to the building or classroom until advised by a university emergency response representative.

If confronted by an act of violence, be prepared to make quick decisions to protect your safety. Flee the area by running away from the source of danger if you can safely do so. If this is not possible, shelter in place by securing classroom or lab doors and windows, closing blinds, and turning off room lights. Lie on the floor out of sight and away from windows and doors. Place cell phones on vibrate so that you can receive messages quietly. Wait for further instructions.

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