Fall 2020 Course 3h
Petra Gruber
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The University of Akron

BIOMIMICRY CERTIFICATE ELECTIVE

BIODESIGN
TEXTILE HYBRIDS

valid for ADVANCED GRAPHIC DESIGN
open to students from all departments

Visiting Artist
Svenja Keune

Studio Biomimetic Design Fall 2020 applies principles of biomimetics to artistic and architectural design and prototyping. We will explore **textile based biocomposites designed for and with living organisms such as plants, insects and bacteria**.
It is an **entry level studio** design exercise, using nature as a model for creating **innovative solutions**, at the intersection of biology and design. No specific knowledge is needed to take this course, students from all departments are welcome. The course outcomes are design project representations including **graphics, digital or analog models and prototypes**.

Harnessing the potentials of living organisms for design and manufacturing is a rapidly expanding field and an approach towards a more sustainable built environment. In this course we will focus on natural textiles, biomaterials and patterns. We will design patterns based on principles from biomimicry which are designed for a chosen organism, compile extrudable substrates from e.g. sand, clay and cellulose, and extrude them onto textile fabrics to create a textile based biocomposite for a spatial application. These structures will be installed in a chosen everyday environment and their transformation and interactions with the environment documented over time. The results, structures, scenarios and autobiographical experiences, will be presented at the Emily Davis Gallery.
The course is held in collaboration with **artistic researcher Svenja Keune** who will visit for two workshops in October and November.

In the light of the current COVID-19 crisis there will be a plan in place to hold this class remotely.

7100:316-001 Biodesign
3100:495/695-002 ST Biology
Tu/Thu 2:00-4:45pm Folk Hall 148
sophomore status/approval from instructor
please contact: pgruber@uakron.edu

The University of Akron
Buchtel College of Arts and Sciences
Myers School of Art

7100: 316 Biodesign

7100:316 Fall 2018 3 credit hours
Folk Hall, Room 148
Monday Wednesday 2:45-5:30pm (Wednesday open lab time)

Instructor:	Petra Gruber	Phone:	330 972 6303
Office:	Folk 181 / ASEC E505	Email:	pgruber@uakron.edu

COURSE DESCRIPTION

The course Biodesign combines an introduction into biomimicry/biomimetic design with a studio design exercise, using nature as a model for creating innovative solutions.

- The lecture part contains an introduction into the basics of biomimetics/biomimicry, and the intersection of biology and design.
- The studio or design part is a solution based biomimetic approach, that takes on nature to inform a novel design project. For this part independent student work in research and design is required. The selection of the biological role model, research, abstraction and application to a new design is carried out in continuous interaction and feedback involving external sources and experts.
- The course outcomes are thematic presentations of specific research themes in nature and a design project presentation including graphics, digital and analog models.

Each year, the course focuses on a specific aspect that may be connected to a current research project or main theme. Field trips to places with high biodiversity are integrated into the schedule.
The course is open to students from different disciplines in the arts, sciences and engineering. Elements of interdisciplinary collaboration and vertical teaching is integrated according to level and expertise of the group.
The course is held weekly on Tuesdays and Thursdays. The time allocated on Thursdays is to be spent independently for research, lab and design activities.

RATIONALE

- For the students, the goal of the course is to give a basic overview over the current activities and developments in the field of biomimetic design, together with an understanding and application of biomimetics as a methodology of information transfer from nature to design.
- The course will increase and foster interdisciplinary research between students from different departments.
- The course will add to the attractiveness of Myers school of Arts for students.
- The introduction of biomimetics into undergraduate and graduate programs will foster the further development of the BRIC initiative.

LEARNING OUTCOMES

- Increase knowledge about the field of biomimetic design
- Ability to apply of the methodology of biomimetics in a design context
- Increase critical thinking and analytic capacity in design
- Sythesize biological information and design problems and create new design solutions

REQUIRED/OPTIONAL TEXTS

Parts of the following books and a selections of specific articles and papers are given as reading assignments and discussed in class:

- Bhushan, Bharat. "Biomimetics: lessons from nature–an overview." (2009): 1445-1486.
- Gruber, Petra. "Biomimetics in architecture: architecture of life and buildings". (2010) Wien: Springer.
- Thompson, Darcy Wentworth. "On growth and form." On growth and form. (1942).
- Vincent, Julian FV, et al. "Biomimetics: its practice and theory." Journal of the Royal Society Interface 3.9 (2006): 471-482.

COURSE GOALS/LEARNING OBJECTIVES

Objectives	Applicable Standards: [See above]	Assignments/Assessments
Become familiar with biomimetics design		Attendance of the lectures Reading responses, Research presentation
Become familiar with biomimetics as a methodology		Analogy research, finding of biological role models, translation concepts
Interdisciplinary collaboration		Design project
Become familiar with the other discipline's tools		Research and design presentations

COURSE CALENDAR

Week	Lecture	Studio/Design project
1	Introduction	Introduction phase
2	Background and Basics	
3	Methods and Tools	Research and analysis phase
4	Biomimetic in Design	
5	Concept presentation	Abstraction and concept phase
6	Studio - special topics	
7	Studio - special topics	
8	Studio - special topics	
9	Studio - special topics	
10	Midterm presentation	Intermediate design phase
11	Studio - review	
12	Studio - review	
13	Studio - review	
14	Studio - review	
15	Final presentation	Final research and project presentation

INSTRUCTIONAL STRATEGIES/ACTIVITIES

Activities included in the course are lectures, video presentations, guest lectures, field trips, basic research activities, studio work, reviews and presentations.
Independent student work includes basic research on the role models, research in the field, libraries, biology and engineering labs, and contacting and requesting information from external organizations and experts. Production of prototypes and collaboration with the FabLab are optional.

MATERIAL COSTS

The costs for materials depend highly on the nature of the project and usually range from 30-100$.

TECHNOLOGY REQUIREMENTS

Basic computer equipment, optional photo/video equipment, drawing tools, optional 3D software.

EVALUATION/STUDENT ASSESSMENT/ATTENDANCE POLICY MYERS SCHOOL OF ART

The assessment of the course is 20% reading response and class activity, and 80% design project. Written summaries have to be delivered for research on biological solutions, concept abstract and design concept. The final design project is presented with a poster or a power point presentation including all relevant steps of the design process and an application scenario. Prototypes and models are requested according to thematic area and concept.
Students are required to attend all class meetings. Students may not miss more than one week's worth of class time without penalty. For each absence in excess of one week, your final course grade will drop by one grade (e.g., from B to B-).
The following grade equivalencies apply:

A	93
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D+	67
D	63
D-	60
F	0

Attendance is recorded each class period. For grading purposes, three late arrivals or early departures will equal one absence. Punctuality is expected. All papers and lessons must be typed and turned in on the due date.

PREREQUISITES

Sophomore standing or approval of instructor

UNIVERSITY AND MYERS SCHOOL OF ART POLICIES

Refer to the Myers School of Art Website, Academic Tab: Resources for Faculty and Staff
http://uakron.edu/art/academics/resources-for-faculty-and-staff.dot

- The University Code of Student Conduct, Ethics and Standards
- Myers After Hours Access Policy
- Myers Attendance Policy
- Title IX Information
- Office of Accessibility and Accommodations
- Myers Studio Use Policy

BIBLIOGRAPHY

- Bhushan, Bharat. "Biomimetics: lessons from nature–an overview." (2009): 1445-1486.
- Gruber, Petra. "Biomimetics in architecture: architecture of life and buildings". (2010) Wien: Springer.
- Imhof, Barbara, and Petra Gruber, eds. "Built to Grow-Blending Architecture and Biology." Birkhäuser, 2015.
- Myers, William. Bio Design. Museum of Modern Art, 2012.
- Thompson, Darcy Wentworth. "On growth and form." On growth and form. (1942).
- Vincent, Julian FV, et al. "Biomimetics: its practice and theory." Journal of the Royal Society Interface 3.9 (2006): 471-482.

SIGNATURE PAGE

I have read and understand the policy/contract requirements for this course.

Course Subject, Catalog and Section Number: 7100:3XX
Course Title: Biodesign
Term/Year: Fall 2018
Instructor: Petra Gruber

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