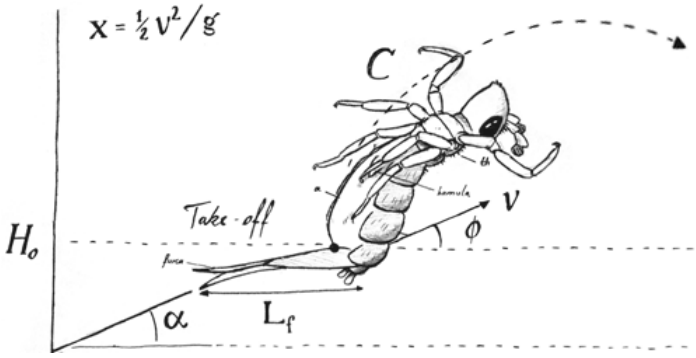
IB 535: Biology and Tech Innovation – Syllabus Summer 2014



Springtail by Nils Cordes (formerly UIUC)

Course Description

This fully online, 8-week course (using a Moodle LMS) focuses on how experts in biology and technological fields find inspiration in nature and use it as a model to make technological innovation and solve human problems. In the future, our day-to-day living, health, and the environment will benefit from using findings in basic research in biology for technological innovation. Topics to be explored include efficient architecture, cooperative control, robotics, multimodal sensory integration for controlling behavior, and advanced materials. The assignments will help students create teaching materials for their own classrooms.

Course Goals and Objectives

Upon completing this course, students will:

- have a solid understanding of nature as inspiration for innovation.
- be able to explain the concepts learned to a variety of audiences, including middle and high school student, in a clear and concise manner.
- be able to apply the tools learned to arrive at sustainable design, engineering, architecture and/or business solutions.
- conclude the course with an overview of bioinspired innovation in the form of a course glossary, as well as a personal bioinspiration archive.

Course Structure

This is a 3-credit hour course. The course is 8 weeks long; it consists of 8 content modules. Please be aware that this course is accelerated; 16 weeks' worth of content will be covered in an 8-week time span. You should dedicate approximately 12–16 hours per week to working on the course itself, but actual time commitments will vary depending on your input, needs, and personal study habits. You are required to log on to the course website a

minimum of 4 days per week but as discussions develop, you will probably need to do so more frequently.

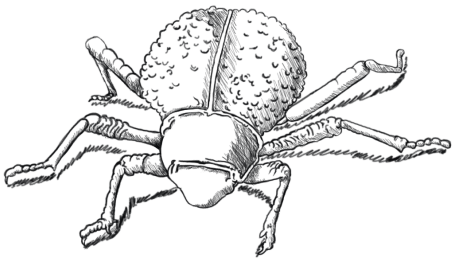
This course is designed with the principles of collaborative learning, constructivism, and active participation in mind. You are encouraged to share your thoughts and engage in problem solving. The course has a consistent and predictable structure, organized around the modules, with a course website that is straightforward and easy to navigate. Instructions and due dates for activities and assignments are clearly articulated so that you know what is expected of you, and you will be able to easily stay on track.

We realize that you have a life beyond the scope of this course. However, if you are unable to complete an assignment because of other obligations, you should notify the instructor or, better yet, prepare the assignment ahead of time and post it early. This will give your classmates a head start in reading and responding to your work. Most assignments are due by 11:55 PM of their respective due dates as listed on the course calendar, giving you and your classmates time to read and comment on each other's work before the next module begins.

Assigned readings and responses to discussion questions should be read and submitted during the module for which they are assigned in order to get the most benefit from the discussions. At the end of each content module, participants will have an opportunity to make sure that they have completed all the required activities and assignments.

Textbooks, Articles and e-Reserves

There are no formal textbooks for this course. Rather, please refer to the optional books of interest, websites, and e-Reserve information listed in the overview of each weekly module.



Beetle by Beth Morgan (UIUC)

Course Outline

Week 1: Introduction to Bioinspiration and Biomimicry. Creativity and Innovation

Week 2: Biological Materials & Nanostructures

Week 3: Robotics

Week 4: Sensing the Environment

Week 5: Chemistry and Energy

Week 6: Maintaining Community

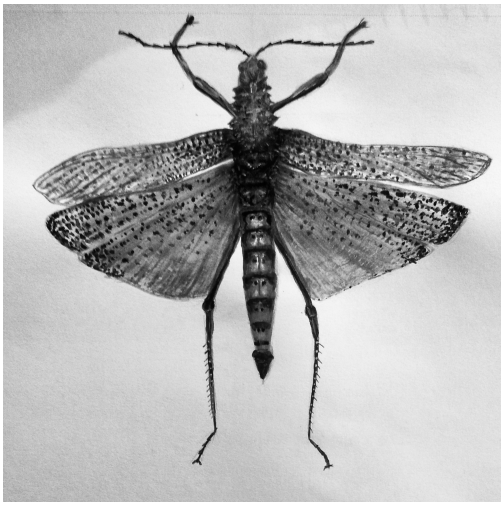
Week 7: Bioinspiration in Architecture

Week 8: The Business of Bioinspiration. Conclusion

Course Activities

Module Overview

Each module will begin with the module overview, explain what the module is about, what learning goals you are expected to achieve, how long the module will take, and in what activities you will participate. Each module is designed with the same structure and activities unless otherwise specified. I tried to create a little bit of variety by changing the expectations for the "Discussions/Forums a little bit from module to module. The module activities are explained in greater detail below. You can find the due dates of specific assignments in the course calendar.



Grasshopper by Rooha Nassir (UIUC)

Readings and Resources

No textbook is required. Each module has required readings that will allow you to gain more insight into the topic – beyond the lecture or to support the lecture. Readings will come from primary literature, secondary literature, or current high-quality science writing on the web (including bioinspiration blog by the instructor). Videos, podcast, audio recordings will also be included into the modules. They are typically interviews with (Illinois) scientists who do cutting-edge research in the field discussed that week.

Lessons

Lessons are designed to give an overview of the topic at hand. The lectures are delivered as Moodle lessons. They will include text, pictures, graphs, video and audio. The lectures are designed specifically for the online environment. All content will be made accessible to all students.

Muddiest Point

Just prior to each week's synchronous session, you will let your instructor know what materials are the least clear to you or most in need of additional explanation. Your instructor will then discuss many of the submitted muddiest points during the synchronous session.

Live Session

Every Tuesday you will have the opportunity to interact synchronously with course participants. During the session you may discuss bioinspiration topics with guest speakers, get your Muddiest Points answered and work on assignments collaboratively.

Discussion Assignment

Each week, you will answer discussion questions or complete an assignment. You will post your work to the Discussion forum. You are expected to contribute constructive feedback to your course-mate’s posts and facilitate the discussion in your own thread.

Collaborative Glossary

Each week, you will contribute your own background research on a bioinspired product or process. You will be assigned a topic each week. You are also expected to give constructive feedback to your course-mate’s entries. Also, update your glossary entry based on other people’s suggestions.

Quizzes

At the end of each module, students will take a self-paced quiz to evaluate new knowledge obtained (from lecture, readings, videos, synchronous discussion, etc.). This will be a mixture of multiple choice, true/false, matching, and short answer questions.

Personal BioInspiration Archive (PBIA)

Throughout the course you will archive your course activities into a form that is useful for you. This is called your Personal Bioinspiration Archive (PBIA). Within the PBIA also discuss how your thinking has changed as a result of the course and how you might apply what you have learned. During the 3rd week you will present your progress on the PBIA and receive feedback from the participants in the course. During the 10th week you will present your final archive during a virtual fair.

Assignments, Weights, and Deliverables

You can access your scores by clicking the Grades link from the left column of the course home page.

All interim and final deliverables have due dates. Failure to meet deadlines results in a reduction of the assignment points. For the due dates of each assignment, please see the course calendar.

Assignments	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Total points per assignment	Relative Weight
"Discussion" Assignment	20	20	20	20	20	20	20	20	160	26%
Collaborative Glossary	20	20	20	20	20	20	20	20	160	26%
Muddiest Point	5	5	5	5	5	5	5	5	40	6%
Quiz	10	10	10	10	10	10	10	10	80	13%
PBIA			40					120	160	26%
~Participation*									20	3%

*A few points (total of 20pts over the whole course) will be awarded for “participation” and “other”. Participation points can be earned when you participate in the Live Sessions, when you ask questions and answer questions in the Course Q & A forum or when you make other students aware of interesting news-stories (through the course Q & A or through Twitter and using the hash-tag #IB535). Also, it is possible that a relevant (web)seminar occurs during the run of the course. Attendance and writing about such a seminar can also earn you “other” points. A maximum of 3 points per module per student are given, and are basically earned by being good citizens.

Grading Scale

Grade	Percent	Grade	Percent
A+	97–100	**C**	72–76.99
A	92–96.99	**C–**	70–71.99
A–	90–91.99	**D+**	67–69.99
B+	87–89.99	**D**	62–66.99
B	82–86.99	**D–**	60–61.99
B–	80–81.99	**F–**	0–59.99
C+	77–79.99		

You are expected to complete your work independently, in accordance with University policy. Failure to do so will result in strict disciplinary action, including loss of all credit for the assignment, notification of a dean, and possible dismissal from the University. You may work with others on homework, but the final product must be your own.

View the Graduate College Handbook for Students, Faculty and Staff Chapter III: Academic Record Grading System page for more information.

A note about sources of information: It is highly recommended that you only consult the following sources of information in studying for this class. Use of another source (such as Internet sites found via Google) may provide information that is unreliable.

- Suggested books and required readings
- Supplemental information posted on course website
- Internet links provided in class or on course website

Instructor Information

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Virtual Office Hours: M 10AM, W 2PM

I am a research scientist in the Department of Entomology. Yep, I am a “bug-doctor”. My main research is on the physiological effects of parasitism on insect hosts. I teach Insect Physiology at the University of Illinois. Lately I have been developing different teaching modules on “Biological Inspiration” because insects can inspire many other fields of research and spark innovation.

I was born and raised in the Netherlands and moved to the U.S. for college. I received my Bachelors in Integrative Biology from the University of California at Berkeley and my Masters in Entomology from the University of California at Riverside. I have lived in Champaign-Urbana since 1995 where I received a Ph.D. in Entomology from the University of Illinois in 2000. Since then I has been a Research Scientist in the Department of Entomology.

I am happily married to a Mechanical Engineer (@ILAlleyne) and we have two sons. I love sports, in particular college basketball and European soccer. I also love to travel

Getting Help

If you need help:

- Only contact your instructor directly if you have a personal question.
- For all other questions about course content, activities, deadlines, technical problems, etc., please check the General Q & A forum to see if someone else has already asked your same question and received a response.
- If your question isn't there yet, post your question to the General Q & A forum. Feel free to help your peers out if you know the answer!
- If you have technical problems, please fill out this form.