IB 535: Biology and Tech Innovation
Summary 2024 Syllabus

Course Overview

- CRN 39620; 4 credit hours
- Online, asynchronous via Moodle at learn.illinois.edu
- Synchronous session via Zoom, Tuesdays from 7:00-8:30pm CST
- Instructor: Allison O'Dwyer (she/her), Instructor, School of Integrative Biology
    - Office Hours: By appointment in Natural History Bldg. Room 2012 or Zoom
    - Contact: aodwyer@illinois.edu

Course Description

This 4-credit hour, fully online, 8-week course focuses on how experts in biology and technological fields use bio-inspiration to create technology innovations to solve human problems. Classic examples, such as how the observation that seeds with barbs stick to animal fur led to Velcro, are explored. Students use and expand upon their current biological knowledge to explore new ways to create biologically-based sustainable innovations. Topics to be explored include nest building as inspiration for energy-efficient architecture, plant chemistry as inspiration for green manufacturing, animal locomotion and sensing as inspiration for robots, and the advances in understanding of biological nanostructures and nanoprocesses as inspiration for nanotechnology.

Course restricted to OMST or Integrative Biology graduate students in master's degree programs.

Student Learning Outcomes

Upon completing this course, students will be able to:

- Understand nature as a source of inspiration for innovation.
- Communicate the process of bioinspired design to a variety of audiences in a clear and concise manner.
- Apply the tools learned to arrive at sustainable design, engineering, architecture and/or business solutions.
- Model the processes of bioinspiration, scientific literature review, bioinspired design, and peer evaluation.

Course Structure

IB 535 is an online, graduate-level, 4-credit course. In a graduate-level, 4-credit course, the student should be expected to devote at least 6-8 hours per week learning the advanced topics of this course (through video lectures and readings), and at least 8-16 additional hours per week on homework assignments and class projects. The instructor will be available for consultation online and/or face-to-face for students who may be on campus. Actual time commitments will vary depending on your input, needs, and personal study habits. You should be logging into the course every day to keep up with the workload and meet deadlines.

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 so you will be able to easily stay on track.

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.

In this course, a Module starts on MONDAY at 12:00 AM Central Time and ends on SUNDAY (+1 week) at 11:59 PM Central Time. Assignments are due by 11:55 PM CST, unless otherwise specified.

Textbooks

There are no formal textbooks for this course. Rather, please refer to the required readings and resources listed in the overview of each weekly module. As this is a graduate-level course, students should be prepared to consume and communicate your understanding of multiple primary and secondary literature sources and peer-reviewed journal articles weekly—skills we also develop within the course.

Grading

All assignments in the course are worth 100 points, with the following distribution and scale:

Distributions

Category	Weight
Discussion Forum	30%
Bioinspiration Database	30%
Assignments	10%
Community Participation	10%
PRTT Project	20%
Total	100%

Grading Scale

Letter Grade	Percentage
A+, A, A-	97-100, 94-96.5, 90-93.5
B+, B, B-	87-89.5, 84-86.5, 80-83.5
C+, C, C-	77-79.5, 74-76.5, 70-73.5,
D+, D, D-	67-69.5, 64-66.5, 60-63.5
F	Below 59.5

Course Components

Each module will begin with an overview page. This page will explain what the module is about, what learning goals you are expected to achieve, and in what activities you will participate. Each module is designed with the same structure and activities unless otherwise specified. The module activities are explained in greater detail below. You can find the due dates of specific assignments on the assignment's page.

Lessons, Readings and Resources—6-8 hours/week

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 (e.g., closed captions provided).

Lessons may have questions included in them. Please answer the questions since they will help you remember what you have learned, or to apply what you have learned and already know. The answers will be recorded and will inform the instructors of the student's interests and abilities.

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 a bioinspiration blog by researchers at Illinois). Videos, podcast, and audio recordings will also be included into the modules. They also include interviews with (Illinois) scientists who do cutting-edge research in the field discussed that week.

Discussion Forum (30%)—3-5 hours/week

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. A little variety is found in the difference in expectations for the forum assignments from module to module. In fact, sometimes the discussion assignment is not really a discussion on a topic with multiple points of view - it is "just" an assignment - but since students are encouraged to share their work and comment on the work of others, the assignment was created as a discussion forum. As this is a graduate-level course, you should be prepared to write here—including a total of 500-1000 words each week. All discussion forums are accompanied by a Discussion Rubric—there are in total eight discussion forum assignments, each worth 100-points.

Bioinspiration Database (30%)—3-5 hours/week

In this milestone, you will collect and report information on the bioinspired design you chose in the Bioinspiration Database Topic Choice. This activity helps you collaboratively create a resource of bioinspiration success stories, biomimicry "green wash" and potential sources for inspiration for novel innovation. The database will serve as a source to reference in your activities throughout the semester.

On odd-numbered module weeks, you will choose a topic from a list of provided bioinspiration concepts. Next (also on odd-numbered weeks) you will complete your database entry post by researching and reporting on this topic, using five sources to complete your entry. See Moodle for entry post requirements and the Database Rubric, including a required total of 500-1000 words. On even-numbered weeks, you will peer-review four entries from your peers as well as self-assessing your own entry, using the Database Rubric.

Finally, also on even-numbered weeks, you will select your Top 4 Bioinspired Designs from the database and create a reflection post (500-1000 words) that expands upon what you learned. See the My Top 4 Bioinspired Designs Instructions and Rubric for full instructions.

In total, there are four database posts (100-points each), four peer-assessment grades (100-points each) and four reflections per student (100-points each).

Assignments (10%)—1-2 hours/week

Minute Papers

Every two weeks, consider the materials you have reviewed during the previous two modules—the lessons, the readings, and any other activities you undertook. You will write a brief reflective post. What was the most interesting thing you learned? What resources would you like to save for later? How will you employ what you've learned in your classroom/professional life? Please mention any problems you might have had understanding any part of the modules. How might this information have been presented differently to make it clearer? You should view this as a formative assessment exercise that will also help the instructor determine where your interests lie and improve on the course for the next time the course is offered.

Orientation Activities

These activities help us orient ourselves to begin work on this course together. Please be sure to see all activities in the Orientation tab.

Community Participation (10%)—2-3 hours/week

Community participation in an online learning environment is essential to your commitment to engagement with our course. Additionally, in sharing resources as educators, biologists/engineers, and community members, we can amplify the impact of this course in your own classrooms and professional lives. Thus, 10% (100 points total) of your overall course grade will come from a measure of your participation in our weekly live sessions, involvement in our Social Forum, and in our Q & A Forum. Ways to attain points in this Community Participation category are listed below.

Live Sessions
Each week (excluding week 7) on Tuesday nights from 7pm-8:30pm there will be a synchronous session in which all students will join online at the same time to discuss the course. These sessions will use *Zoom* to join all participants together in a session where you can text chat, video/voice chat, and see the computer desktop of the instructor. These sessions will typically involve a guest lecturer from UIUC

presenting on their research and a Q & A session, or a series of group activities/discussions. You are not required to attend all of these sessions live (you can view a recording and make-up any participation work if needed), but material covered on them is fair game for assessments and they are important to feel part of a learning community. Additionally, attending the lectures live is one way to add to your point total within the Community Participation portion of your grade for this course. The recordings of the live sessions will be available after each session, thus if you are unable to attend a live session you may view the recording. Active participation includes being prepared with required pre-reading content, providing feedback to peers, speaking and listening in groups, and asking questions of peers and speakers. In total, there are seven Live Sessions, evaluated according to our Live Session Participation Rubric.

Forum Participation

- 20 points: Social Forum postings and replies. Each post is worth 6 points and each reply is worth 4 points (for a maximum of 20 points total). Ideas for posts include:
  - K-12 Resources/Lesson Plans related to bioinspiration
  - Current Events/News articles related to bioinspiration
  - Reply to any post with meaningful commentary
- 20 points: Q & A Forum postings and replies. Each post is worth 6 points and each reply is worth 4 points (for a maximum of 20 points total). Ideas for posts include:
  - Any non-personal (i.e. grade-related) questions related to the course
  - Reply to any question asked
- 60 points: Live Session Attendance. Each live session you attend is worth 20 points. (For a maximum of 60 points)

Actually, the hope is you will not see this "participation" as another box to check. Instead, students are encouraged to share findings and thoughts, sometimes beyond just the people in the course. It will be easy and is bound to be fun and fulfilling.

Peer-Reviewed Teaching Tool Project (20%)

As a final project for the course, you are tasked to create a Teaching Tool related to a topic discussed in the course. This tool has to be creative, yet informative. Student choice is built into this tool as it can be in the form of a video, podcast, comic, interview, etc. To increase accessibility in the course, you will also submit a written transcript. Once your project has been submitted in accordance with the rubric, your peers will grade your project, and you will grade your peers as we model the peer-review process. In satisfying the College of Liberal Arts and Sciences requirement that at least 20% of an online course's grade come from work that has the students identity verified, you will be required to show your face at least briefly on camera for this project.

This project is worth 400-points in total. The project's first grade is earned from a 100-point PRTT Project Organizer where students first begin to organize and document their peer-reviewed literature analysis. Next, students earn 100-points for submitting a PRTT Project Proposal, evaluated according to the PRTT Proposal Rubric. For the final PRTT score, students will receive two separate 100-point scores, one for the final PRTT Project submission (peer-evaluated) and one for the PRTT Project assessment score, which evaluates the effectiveness of the student's peer evaluation. See the PRTT Project tab on Moodle for rubrics on all four scores.

A note about sources of information: It is highly recommended that you only consult sources from the Reputable Sources list, and, of course, peer-reviewed articles available to you through our fantastic UIUC library. Use of another source (such as internet sites found via Google) may provide information that is unreliable.

Tentative Course Schedule

Week	Topic	Major Assignments Due

1 (June 10)	Module 1: Introduction to Bioinspiration and Biomimicry/Creativity and Innovation	• Orientation Activities • Module 1 Lessons and Resources • Synchronous Session (Tues 7pm) • M1 Discussion (post, replies, wrap-up) • M1/M2 Bioinspiration Database
2 (June 17)	Module 2: Biological Materials & Nanostructures	• Module 2 Lessons and Resources • Synchronous Session (Tues 7pm) • M2 Discussion (post, replies, wrap-up) • M1/M2 Bioinspiration Database Peer Review • M1/M2 My Top 4 Bioinspired Designs
3 (June 24)	Module 3: Robotics	• Module 3 Lessons and Resources • Synchronous Session (Tues 7pm) • M3 Discussion (post, replies, wrap-up) • M3/M4 Bioinspiration Database
4 (July 1)	Module 4: Sensing the Environment	• Module 4 Lessons and Resources • Synchronous Session (Tues 7pm) • M4 Discussion (post, replies, wrap-up) • M3/M4 Bioinspiration Database Peer Review • M3/M4 My Top 4 Bioinspired Designs • PRTT Project Proposal
5 (July 8)	Module 5: Energy and Architecture	• Module 5 Lessons and Resources • Synchronous Session (Tues 7pm) • M5 Discussion (post, replies, wrap-up) • M5/M6 Bioinspiration Database • First 3 columns on PRTT Project Organizer
6 (July 15)	Module 6: Maintaining Community	• Module 6 Lessons and Resources • Synchronous Session (Tues 7pm) • M6 Discussion (post, replies, wrap-up) • M5/M6 Bioinspiration Database Peer Review • M5/M6 My Top 4 Bioinspired Designs • PRTT Project Organizer
7 (July 22)	Module 7: Bioinspiration and Human Health	• Module 7 Lessons and Resources • M7 Discussion (post, replies, wrap-up) • M7/M8 Bioinspiration Database
8 (Jul 29)	Module 8: Business of Bioinspiration + PRTT Projects	• Module 8 Lessons and Resources • Synchronous Session (Tues 7pm) • M8 Discussion (post, replies, wrap-up) • M7/M8 Bioinspiration Database Peer Review • M7/M8 My Top 4 Bioinspired Designs • PRTT Project Submission and Peer Grading

Getting Help

The instructor is available for virtual office hours by appointment. Please do not hesitate to reach out to set up an appointment to meet in person or virtually. Contact the instructor at aodwyer@illinois.edu (Allison O'Dwyer). To better facilitate our community, please 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! Your instructor will also respond on this forum as well, so rest assured, we will all help

to find answers! If you have technical problems with the course, please fill out this form: http://www.atlas.illinois.edu/support/teaching/moodle/student/

Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students must contact both the instructors and the Disability Resources and Educational Services (DRES) as soon as possible (https://www.disability.illinois.edu). You can contact DRES at 1207 S. Oak Street, Champaign, (217) 333-4603 (V/TTY), or via email at disability@illinois.edu.

Attendance

Your instructor realizes that you have a life beyond the scope of this course. However, if you are unable to complete an assignment/attend class because of other obligations, you should notify the instructor ahead of time. It is good practice to prepare/post any assignments early before a planned absence. Unexcused late work will receive a 10% per day penalty.

Regular class attendance is expected of all students, but the lowest participation score for synchronous session attendance will be dropped to allow for extenuating circumstances, particularly as instructors realize many are still dealing with the effects from the Covid pandemic.

Again, students should inform instructors in advance of missing class and generally adhere to the guidelines specified in the UIUC Student Code (http://studentcode.illinois.edu/article1_part5_1-501.html).

Diversity, Equity, and Inclusion (DEI)

In forming an inclusive course, it is meant a course that values and creates space for all identities such as those based on ethnicity, culture, sexual identity, gender identity, religious identity and beyond. Research shows that inclusive courses allow for better learning outcomes, a more positive learning experience, better community, and better leadership training in engaging humanity.

To create an inclusive space in this course, we must all work to collaboratively create a safe and respected space that supports and encourages everyone to share their views and concerns. We must value multiple perspectives and experiences, while also reducing student experiences of marginalization. We must treat each other as individuals.

Students are encouraged to share any feedback on how instructors, TAs, or fellow students could work to better create this inclusive space. Feedback can be given to the instructors at any time, anonymously using our Inclusivity Feedback Form (you may need to access this form via your Illinois Google Apps account but know that the form is still anonymous).

Support

Basic needs insecurity is common among college students and the negative impacts are real:

- Increases difficulty in concentrating and studying, lowers retention, and decreases graduation rate.
- Generates and/or elevates depression, anxiety, insomnia, headaches, and burnout.
- Lowers morale and motivation, reduces creativity, hinders communication, decreases productivity, increase absenteeism, and decreases social opportunities.

Students who are hungry, burned-out, depressed, preoccupied with issues like money are less likely to succeed academically, socially, and personally. If at any point in the semester you are struggling with mental health issues (anxiety, depression, grief, PTSD, addiction, cultural struggles, coming out, etc.), inconsistent access to nutritious foods, housing or financial instability, or lack of access to any other basic needs, know that I have an open door and can help point you to the many resources on campus to help. Seeking support is healthy and courageous.

Mental Health

Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services, and specialized screenings which are covered through the Student Health Fee (see https://wellness.illinois.edu). If you or someone you know experiences any of the above mental health

concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center (217) 333-3704
- McKinley Health Center (217) 333-2700
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)
- If you are in immediate danger, call 911.

Community of Care

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regard to their well-being or yours, you are encouraged to refer this behavior to the Student Assistance Center 217-333-0050 or http://odos.illinois.edu/community-of-care/referral/). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, it is understood the impact that struggles with mental health can have on your experience at Illinois. Significant stress, strained relationships, anxiety, excessive worry, alcohol/drug problems, a loss of motivation, or problems with eating and/or sleeping can all interfere with optimal academic performance. All students are encouraged to reach out to talk with someone, and make sure you are aware that you can access mental health support at McKinley Health Center (https://mckinley.illinois.edu/). Or the Counseling Center (https://counselingcenter.illinois.edu/). For urgent matters during business hours, no appointment is needed to contact the Counseling Center. For mental health emergencies, you can call 911.

Food Assistance and Wellbeing Program

Among college students, 35-51% report experiencing food insecurity. At UIUC around 1 in 5 students experience food insecurity. Proper nutrition has been linked to positive brain function and better academic outcomes; don't settle for the "right of passage" of living on cheap, processed food. There are several community and campus resources to get you the nutrition you need to succeed. You can find them here: https://odos.illinois.edu/community-of-care/resources/students/food-resources/

Instructor Responses and Office Hours

Questions posted via email or to the Course Q & A forum generally will be answered within 48 hours. Students are encouraged to answer questions posted by other students to the Course Q & A forum rather than waiting for an instructor's response.

Another way to communicate with the instructors is to make use of the virtual office hours. The instructors will be available for office hours via Zoom by scheduled appointment (just email us!).

Academic Integrity

Academic dishonesty will not be tolerated. Examples of academic dishonesty include the following:

- Cheating
- Fabrication
- Facilitating infractions of academic integrity
- Plagiarism
- Bribes, favors, and threats

- Academic interference
- Examination by proxy
- Grade tampering
- Non-original works

Should an incident arise in which a student is thought to have violated academic integrity, the student will be processed under the disciplinary policy set forth in the Illinois Academic Integrity Policy, using the FAIR system (https://studentcode.illinois.edu/article1/part4/1-401/). If you do not understand relevant definitions of academic infractions, contact your instructors for an explanation within the first week of class.

Copyright

Student Content

Participants in University of Illinois courses retain copyright of all assignments and posts they complete; however, all materials may be used for educational purposes within the given course. In group projects, only the portion of the work completed by a particular individual is copyrighted by that individual. The University of

Illinois may request that students' materials be shared with future courses, but such sharing will only be done with the students' consent. The information that students submit during a course may, however, be used for the purposes of administrative data collection and research. No personal information is retained without the students' consent.

Non-Student Content
Everything on this site and within University of Illinois courses is copyrighted. The copyrights of all non-student work are owned by the University of Illinois Board of Trustees, except in approved cases where the original creator retains copyright of the material. Copyrights to external links are owned by or are the responsibility of those external sites. Students are free to view and print material from this site so long as

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- Copies of any material include the respective copyright notice.

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Student Behavior

Student Conduct
Students are expected to behave in accordance with the penal and civil statutes of all applicable local, state, and federal governments, with the rules and regulations of the Board of Regents, and with University regulations and administrative rules. For more information about the student code and handbook, see academic integrity policy and procedure (https://studentcode.illinois.edu/article1/part4/1-402/).

Netiquette
In any social interaction, certain rules of etiquette are expected and contribute to more enjoyable and productive communication. The following are tips for interacting online via e-mail or discussion board messages, adapted from guidelines originally compiled by Chuq Von Rospach and Gene Spafford (1995):

- Remember that the person receiving your message is someone like you, deserving and appreciating courtesy and respect.
- Be brief; succinct, thoughtful messages have the greatest effect.
- Your messages reflect on you personally; take time to make sure that you are proud of their form and content.
- Use descriptive subject headings in your e-mails.
- Think about your audience and the relevance of your messages.
- Be careful when you use humor and sarcasm; absent the voice inflections and body language that aid face-to-face communication, Internet messages are easy to misinterpret.
- When making follow-up comments, summarize the parts of the message to which you are responding.
- Avoid repeating what has already been said; needless repetition is ineffective communication.
- Cite appropriate references whenever using someone else's ideas, thoughts, or words.