

# Bioinspired Design Course

*“The great book, always open and which we should make an effort to read, is that of Nature” -  
Antoni Gaudi.*

## 1. Course General Information

- **Meeting Time:** MWF (Time: 3-3:50 pm)
- **Meeting Location:** MSEB 305 (Lectures) and MEL 2009 (Labs)
- **Textbooks:** A list of suggested readings will be posted on the course website
- **Course Website:** Notes from class, assignments, project handouts and labs will be available through Compass.

## 2. Course Overview & Objectives

ME 498/IB496 offers a unique **interdisciplinary advanced design experience** in the field of bioinspiration. Throughout the course of the semester, students will work in interdisciplinary teams and learn how to integrate biology into the engineering design process. By the end of the course, students will be able to use analogical design concepts and produce a prototype based on a biological function to solve an engineering challenge. Students will be able to do a variety of design tasks in interdisciplinary teams including:

- Understand the advantages and applications of Bio-inspired Design
- Ideate and apply creative thinking methods
- Prototype using different tools
- Learn various methods for design synthesis
- Understand and apply the difference between critical function and critical experience prototypes
- Design, build, and test a prototype that either solves an engineering challenge using observation from nature or improves current nature study tools using innovative engineering technology.

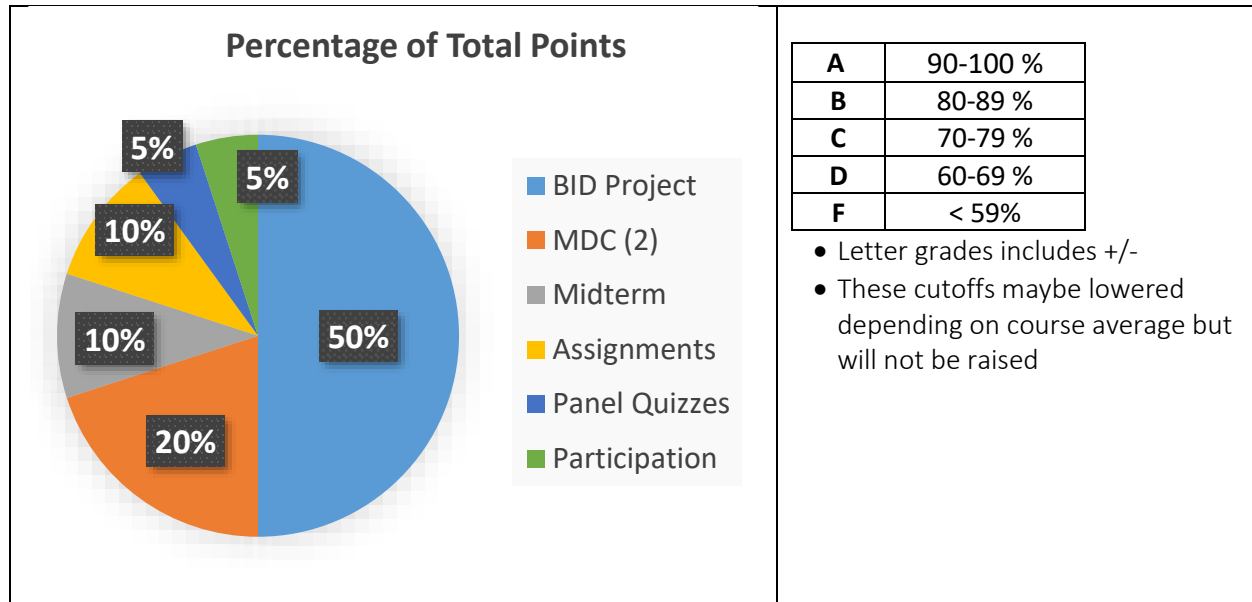
## 3. Course Outline

Time	Topic
Week 1-2	Bio-inspiration Background and Motivation
Week 3	Design Process
Week 4	Discovery of State-of-the-Art Literature
Week 5	Shape, Behavior, and Function (SBF)
Weeks 6-7	Problem Identification + Product and Solution Concept
Weeks 7-8	Empathy and Design Embodiment
Week 9-12	Final Project: Concept Design Review
Weeks 13-16	Final Project: Critical Design Reviews and Evaluation

## 4. Teaching Team Information

Role	Name	Office Hours	Email
Co-Instructor	Aimy Wissa	Monday Noon-1:00 pm (MEL 1421)	<a href="mailto:awissa@illinois.edu">awissa@illinois.edu</a>
Co-Instructor	Marianne Alleyne	Thursday 11-Noon (518A Morrill Hall)	<a href="mailto:vanlaarh@illinois.edu">vanlaarh@illinois.edu</a>
TA	Ophelia Bolmin	Friday 2-3pm (MEL 1421)	<a href="mailto:obolmin2@illinois.edu">obolmin2@illinois.edu</a>
TA	Mihary Ito	Tuesday 1-2pm (MEL 1421)	<a href="mailto:mri2@illinois.edu">mri2@illinois.edu</a>

### 5. Grading & Scoring



### 6. Projects (50 %)

Students will complete one bio-inspired design project over the course of the semester. At various points during the course updates to the project and report will be due at 11:55 Pm of the due date. Late projects will not be accepted. You will use a template (created by the instructors) to share the typed updates. More information on the reporting format will be distributed at a later time. Projects will be done in teams of 3-4 students. Teams will be created by the instructional team based on CATME data.

### 7. Mini Design Challenges and Assignments (30%)

There will be 6 labs in this course. For each lab there will be a post lab that you are expected to complete either individually or as a team. Completed activity sheets have to be submitted by 11:55 pm CT on the due date. Due dates will be on Compass. These include:

Two Mini-Design Challenges	Go to the collection
CATME Survey	Innovation Studio Training/Proof of Training
Peer Evaluation Completion (2)	Seminars

- Peer evaluations - You will complete peer evaluations of your team members 2 times this semester. The evaluations will be online using a software called CATME. This is also the software that we will use to form your teams. More instructions about the software and the evaluations will be presented elsewhere. These peer evaluations will be taken into consideration when evaluating your final project grade.
- CATME Survey – Students are required to complete a CATME survey to help guide the instructors in creating effective teams.
- Innovation Studio training – For safety purposes the students are required to show proof of completion of Innovation Studio training (including 3D printing and laser-cutting machines)
- Go to the collection – Students will be required to visit the various collections at the Illinois Natural History Survey on a particular day (see schedule for details). At the collection students

will be asked to observe the collected organisms and think about the behaviors and functions of various structures they observe.

- Seminar – during the semester students are required to attend at least 3 biology seminars. Instructors will share potentially interesting talks with the students on a weekly basis. Attending at least 2 talks during the GEEB symposium day on Feb x will count for a maximum of 2 seminar credits. Prompts for reports on seminar attendance will be shared on Compass. Students are required to upload their reports within 1 week of attending the seminar.

## 8. [Midterm \(10%\)](#)

There will be an in-class midterm (see schedule for tentative date). The midterm is designed to test important concepts discussed in lecture and during the design exercises and studios.

## 9. [Panel Quizzes \(5%\)](#)

Twice during the semester an experts panel will visit the class. Prior to the panel students are required to watch interviews with the panel participants and to read 1-2 of their scientific papers. The first panel will be comprised of biologists and the second of engineers who work on fields related to bio-inspiration. After watching the videos and reading the papers, but before the panel class session, students are required to complete a quiz about what they have learned. This is to ensure that students will be prepared to meet with the experts and ask them relevant questions about their work. Quizzes will be available on Compass and have to be completed by 11:55pm the evening prior to the panel class time.

## 10. [Participation \(5%\)](#)

The quality of this course highly depends on the interactions between the students with one another and with the teaching team. Please come to class ready to participate. Staying engaged in class and during labs is critical.

## 11. [Makeups and Late Submission](#)

Contact the instructor at least **24 hours before class** with appropriate proof (e.g., job interview e-mail) if you plan on missing class/lab. If you don't contact the instructor in advance due to unexpected reason, you need to show other written proof (e.g. doctor's note and a letter from emergency dean's office) depending on your reason afterwards.

Assignments, labs and final project milestones are due by 11:55 PM CT on the dates specified on Compass, unless otherwise noted. Unless permission from the instructor is obtained at least 1 day before a due date, the late submission policy below will be enforced:

- Final Project Milestones: No Late submissions accepted
- Assignments: Late assignments will be accepted the next day for a 20% penalty with an additional 10% penalty for each additional day for up to 3 days after the original deadline.
- In-Class Activities/Labs: Late labs are not accepted.

## 12. [Accommodations for Disabilities](#)

To obtain disability-related accommodations for this class, students with disabilities are advised to contact the instructor and the Division of Rehabilitation-Education Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603 (V/TDD), or email <disability@uiuc.edu>.

### 13. Equity and Diversity

This is an equal opportunity classroom environment. We value the diversity represented by the participants in this course. Our diversity is a primary source of ideas and perspectives. As you work through the course, practice using this diversity to your advantage.

### 14. Emergency Planning

In an emergency in this building, we have three choices: RUN (get out), HIDE (find a safe place to stay inside), or FIGHT (with anything available to increase our odds for survival). Learn the different ways to leave this building. If severe weather and leaving is not a good option, go to a low level in the middle of the building, away from windows. If a security threat, such as an active shooter, remember: RUN away or HIDE if you can, FIGHT if you have no other option. Sign up for emergency text messages at [emergency.illinois.edu](http://emergency.illinois.edu). You will receive information from the police and administration during these types of situations. If you have questions, go to [police.illinois.edu](http://police.illinois.edu), or call 217-333-1216.

### 15. Academic Integrity

You are welcome to use any available resources (library, faculty, TA, computers, etc.) to do your design projects and homework. This includes discussions with other students. However, each student must do his or her own write-up for any individual assignment (unless specified as a team activity), this includes separate computer programs and output. For team assignments, be sure to include the names of all team members. Academic integrity rules should be followed closely: [http://admin.illinois.edu/policy/code/article1\\_part4\\_1401.html](http://admin.illinois.edu/policy/code/article1_part4_1401.html). Academic dishonesty will not be tolerated.

## 16. [Tentative Lecture Schedule](#)

<b>Tentative Schedule</b>				
<b>Week</b>	<b>Day</b>	<b>Date</b>	<b>Topic</b>	<b>Location</b>
1	M	14-Jan	Introduction to BID and Course	MSEB 305
1	W	16-Jan	Limitation of BID	MSEB 205
1	F	18-Jan	Mini-Design Challenge 1 - Studio 1	MEL 2009
2	M	21-Jan	No Class	
2	W	23-Jan	BID Case Study	MSEB 305
2	F	25-Jan	Mini-Design Challenge 1 - Studio 2	MEL 2009
3	M	28-Jan	Design Process I	MSEB 305
3	W	30-Jan	Mini-Design Challenge 2 - Studio 1	MEL 2009
3	F	1-Feb	Design Process II	MSEB 305
4	M	4-Feb	Discovery (Literature Review Techniques)	MSEB 305
4	W	6-Feb	Project Introduction	MSEB 305
4	F	8-Feb	Mini-Design Challenge 2 – Studio 2 (Competition)	MEL 2009
5	M	11-Feb	SBF Introduction	MSEB 305
5	W	13-Feb	SBF 2	MSEB 305
5	F	15-Feb	SBF Exercise	MSEB 305
6	M	18-Feb	Morphological Tables/Principle Extraction	MSEB 305
6	W	20-Feb	Problem Identification	MSEB 305
6	F	22-Feb	Collection Visit/Biology Panel	MSEB 305
7	M	25-Feb	Collection Visit /Biology Panel	MSEB 305
7	W	27-Feb	Empathy and Bench Marking	MSEB 305
7	F	1-Mar	Morphological Matrix Discussion	MEL 2009
8	M	4-Mar	Empathy and Personas	MSEB 305
8	W	6-Mar	Specifications	MSEB 305
8	F	8-Mar	Ideation on Embodiments and Concept Evaluation	MSEB 305
9	M	11-Mar	Ideation exercise	MEL 2009
9	W	13-Mar	Conceptual Design Presentation	MSEB 305
9	F	15-Mar	Conceptual Design Presentation	MSEB 305
10			Spring Break – No Class	
11	M	25-Mar	Four Box Tool for Reflection and Prototyping	MSEB 305
11	W	27-Mar	Midterm	MSEB 305
11	F	29-Mar	Reflection Discussion	MEL 2009
12	M	1-Apr	Engineering Panel	MSEB 305
12	W	3-Apr	Critical Function Prototype Proposal Discussion	MEL 2009
12	F	5-Apr	Experiment Design	MSEB 305
12	M	8-Apr	Design Studio/Low Fidelity Prototyping	MEL 2009
13	W	10-Apr	Critical Design Presentation (Low fi Proto)	MSEB 305
13	F	12-Apr	Critical Design Presentation (Low fi Proto)	MSEB 305
13	M	15-Apr	Share with Experimental Plans w/ Expert	MSEB 305

14	W	17-Apr	Design Studio	MEL 2009
14	F	19-Apr	Design Studio	MEL 2009
14	M	22-Apr	Design Studio	MEL 2009
15	W	24-Apr	Experimental Evaluation	MEL 2009
15	F	26-Apr	Data Analysis	MEL 2009
15	M	29-Apr	Demo to Class	MEL 2009
16	W	1-May	Presentation Preparation	MSEB 305
Final Presentations on May 9th at 8:00-11:00 am. Location TBD				