

BIOLOGICALLY INSPIRED DESIGN
BIOL/ME/MSA/ISYE/PTFE 4803
TuTh 135-255p, Cherry Emerson 320
COURSE SYLLABUS

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Office Hours:
Tuesdays 3:30 – 5:00
Monday T.B.D.
Or meet by appointment.

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Lesson Plan

Date	Lesson	Date	Lesson
08/19/08	Inspiration, Goals, Class Structure	08/21/08	Design process, ideation (IDEO), creativity, innovation.
08/26/08	Evolution as designer, biology vs. human engineering, sustainability, design space, life's principles. How to do Found Object exercises.	08/28/08	Review of Found Object Exercise 1 Water problems discussion.
09/02/08	How to investigate nature: Web of Science, search strategies, practice exercises. Functional Abstraction	09/04/08	Found Object Exercise 2 Review search and summaries homework. Form final project teams.
09/09/08	Guest Lecture: Bio inspired Locomotion	09/11/08	Found Object Exercise 3 Team work: decide on a problem.
09/16/08	Guest Lecture: Analogical Design Lecture	09/18/08	Review analogy homework. Team Work: work on biological analogies.
09/23/08	Guest Lecture: Green Chemistry	09/25/08	Found Object Exercise 4 Team work: define/refine the problem; functional abstraction.
09/30/08	Bio inspired Sensors/Photonics	10/02/08	Found Object Exercise 5 Team work: work on biological analogies; decide on top 5 biological sources.
10/07/08	Guest Lecture: BioMaterials	10/09/08	Found Object Exercise 6 Team work: detailed understanding of top 5 biological sources.
10/14/08	School Holiday (Fall Break)	10/16/08	Guest Lecture: Bio inspired Complex Systems
10/21/08	Found Object Exercise 7 Team work: Posters presentations.	10/23/08	Poster presentations.
10/28/08	Industry Speaker	10/30/08	Team Work :Initial Designs.
11/04/08	Entrepreneurship	11/06/08	Team Work: Material selection.
11/11/08	Quantitative Analysis & Marketing and Economics.	11/13/08	Team Work: Feasibility & Market and Economics.
11/18/08	Green architecture. Biologically built environments.	11/20/08	Team Work: Final Design.
11/25/08	Team Work: Final Presentations.	11/27/08	School Holiday (Thanksgiving)
12/02/08	Final Presentations	12/04/08	Final Presentations

Guest Lecture Topics:

The six guest lectures will cover the following biologically inspired topics, dates T.B.D.:

- Locomotion
- Sensing/Photonics
- Hierarchical Structures
- Biomaterials
- Green Chemistry
- Complex Systems

Grading

Idea Journal (10%)

Weekly journal entries reflecting insights from the week, spontaneous ideas, design concepts, interesting biological observations, interdisciplinary design team insights, etc. The journal should be in a single bound notebook with no loose pages. It will be turned in during the middle of the semester and at the end of the class for grading.

Found Object Exercises (15%)

Each found object exercise will require a graded 1-2 page (single or double spaced) analysis of a found object. These exercises will be related to guest speaker lectures. There will be 7 found object exercises as well.

Project Related Weekly Assignments (15%)

Individual Challenge Statements
Individual Water Problem Descriptions
Team Water Problem with Elaboration*
Individual Biological Sources
Team Biological Sources with understanding*
Initial Design Concept*
Material Selection*
Feasibility and Technical Assessment*
Market and Economic Assessment*
10 Reference summaries

Completing the weekly assignments will greatly minimize the amount of work the team is required to do for the final report, and allow the team to focus on depth of design. The final report will in essence be a revised version of all of the assignments marked with an asterisk(*).

Final Team Project: (40%)

- Poster (10%)
- Final Presentation (10%)
- Final Report (15%)
- Team/Peer Assessment (5%)

The final report should be 12 – 15 pages in length, single or double spaced not including diagrams, tables, and references. The final design report should have evaluations of at least 5 biological systems, and must show understanding of and incorporate deep principles from at least one biological source. Minimally, 5 papers, preferably 10-15 should be cited with respect to the *biological systems evaluations*. The report should also cite at least 10 additional papers relevant to the *design space* being explored, either problem space or solution space (existing or new).

Take Home Final (10%)

Reflections over the course of the semester should be summarized in a 3-5 page document, graded on depth of insight.

Class Participation (10%)

During class students should demonstrate knowledge of readings, engage in lecture Q&A sessions, and participate actively in found object exercises and team design sessions. Students are being given extensive freedom and time for in-class project work, where students are expected to be prepared and to engage with instructors. Student should not be afraid to try and test radical ideas and to, above all, have fun with their designs.

Class Participation fine print: at the discretion of the instructors, deductions will be made to class participation scores for lack of preparation, reading/sending personal email in class, web surfing, texting, cell phone ringing (bonus deduction for really annoying ringtones), engaging in otherwise non-productive use of free class time or otherwise not having design-centered fun.