

BIO-460

**Bioinspired approaches to engineering**

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Cursus	Sem.	Type
Bioengineering	MA1, MA3	Obl.
Sciences du vivant	MA1, MA3	Opt.

Language of teaching	English
Credits	2
Session	Winter
Semester	Fall
Exam	During the semester
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	1 weekly
Project	1 weekly
<b>Number of positions</b>	<b>55</b>

**Summary**

Bioinspired engineering is an approach that looks at how other organisms have solved the same engineering problems we are facing today and then applies these solutions to create new materials, processes and products. Like, cement produced by bacteria or solar panels that work like leaves.

**Content**

**THEORY (35%)**– lectures that introduce student to a subject and give it basics to pursue the approach on its own over individual exercises and group project

- Introduction to Biomimicry and Bioinspired thinking
- Nature inspired: Materials, Robotics, Computing, Energy, Medicine (45 minute lectures from invited EPFL researchers – in order to present great projects at the EPFL)
- Life's Principals
- Systems thinking: everything is a system and a unit
- Emerging Patterns in Nature
- Biomimicry Methodology and creative problem solving

**EXERCISES (15%)**– short individual exercises that put theory into practice. Often held in the field in order to reinforce learning through real examples (Botanical Garden, Lac Lemman, Natural History Museum, and new Aquarium).

- From Engineering problem to Biological Solution
- From Biological Function to Engineering Solution
- Applying Life's principals to a design

**PROJECT (50%)** –group projects. Each group is given an engineering problem and needs to present their biomimicry solution

- Group work on a given biomimicry project
- Final project presentation

**Keywords**

Bioinspired, nature inspired engineering, biomimicry, systems thinking, sustainable design

**Learning Prerequisites****Required courses**

no courses

### Learning Outcomes

By the end of the course, the student must be able to:

- Apply bioinspired thinking in any situation
- Test your solutions against life's principles
- Design your own bioinspired solutions

### Teaching methods

Ex cathedra lectures, exercises, field trips (Natural History Museum, Aquarium Botanical Garden), one to one consulting over the project phase

### Expected student activities

- Attending lectures
- Solving exercises
- Develop your own bioinspired solution
- Present your final project

### Assessment methods

- 40% Reports from practical exercises (use of biological strategies, creativity)
- 60% Final project (use of biological strategies, social and environmental benefits, feasibility, creativity, communication)

### Resources

#### Bibliography

- Le vivant comme modèle, G.Chapelle (livre en Français)
- Biomimicry: Innovation inspired by Nature, J.Benyus

#### Ressources en bibliothèque

- [Biomimicry: Innovation inspired by Nature / Benyus](#)
- [Le vivant comme modèle / Chapelle](#)