Basic course in biochemistry as well as cellular and molecular biology for non-life science students enrolling at the Master or PhD thesis level from various engineering disciplines. It reviews essential notions necessary for a training in biology-related engineering fields.

The course gives basic knowledge on various phenomena taking place within a cell, and among cells within tissues and organs. The course gives an integrated view of various molecular mechanisms (rather in the second half of the class). It should therefore allow engineering students involved in future projects touching on biomedical problems to better integrate the constraints of a biological system and to enable them to communicate with specialists in both fields. This course is not available to students who had already taken basic cell biology or biochemistry classes during their Bachelor studies at EPFL or elsewhere. This applies for example to the course BIO-109 "Introduction to Life Sciences for Information Sciences" and MSE 212 "Biology for engineers"

The course contains chapters on the following subjects:
1. Cells and Organs
2. Chemical components of cells
3. Proteins, Enzymes
4. Energy, Metabolism
5. DNA, Chromosomes, Replication
6. Gene expression
7. Recombinant techniques
8. Membrane and Transport
9. Intracellular trafficking
10. Cytoskeleton
11. Cell division, Mitosis
12. Genetics, Meiosis
13. Cell communication, Signaling
14. Tissue, Tissue regeneration

Required courses
Bachelor degree in engineering or other non-life science discipline

Recommended courses
Some basic knowledge in chemistry can help, but not required

Important concepts to start the course
Curiosity about how biological systems work, willingness to acquire a certain amount of facts and details necessary to understand and discuss the various molecular mechanisms present in cells or related to modern biology

**Learning Outcomes**

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

- Describe the basic components and functions found in cells
- Draw schemes explaining essential cellular phenomena
- Explain which are the important metabolic pathways
- Translate information from genetic code
- Verify statements about specific cellular mechanisms
- Integrate knowledge from different cellular mechanisms

**Transversal skills**

- Access and evaluate appropriate sources of information.

**Teaching methods**

2 hours of ex cathedra-type of lecture
2 hours of exercises: the instructor gives out appr. 10 questions out (through Moodle and in the beginning of the session). The questions have different formats, and can in some cases just retrieve the acquired facts, in others have a more integrative problem-based learning approach.

**Expected student activities**

- review regularly the presented lectures.
- participate actively in the exercise sessions when the questions and problems are discussed altogether

**Assessment methods**

- a written exam at the winter exam session

**Supervision**

<table>
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<th>Office hours</th>
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<td>Assistants</td>
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<tr>
<td>Forum</td>
<td>No</td>
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<tr>
<td>Others</td>
<td>- the teacher can always be reached through Email or phone to fix a one-to-one discussion about specific subjects</td>
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</tbody>
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**Resources**

**Bibliography**

The lecture is aligned to selected chapters in the following book (recommended although not required): "Essential Cell Bioogy" by B Alberts et al., 3rd edition, Garland Science Taylor & Francis Group

**Ressources en bibliothèque**

- Essential Cell Biology / Alberts