PHYS-301 **Biophysics : physics of the cell**

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Cursus	Sem.	Type
Biomedical technologies minor	E	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Mechanical engineering	MA2, MA4	Opt.
Physics	BA6	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Written
Workload	90h
Weeks	14
Hours	**3 weekly**
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

In this course we will study the cell (minimum unit of life) and its components. We will study several key cellular features : membranes, genomes, channels and receptors. We will apply the laws of physics to develop models to make quantitative and predictive statements.

Content

Introduction to cell biophysics

Topics (lectures):
1. Biological membranes: Hydrophobic effect, 2D elasticity (2-4)
2. Molecular events: Ligand binding, ion channel function (5-7)
3. Transport in cellular systems: Diffusive, directed, crowded (8-11)
4. Genomes: Regulation, transcription, networks and circuits (12-14)

Content:
1. Introduction of biological systems and concepts
2. Description of observations and measurements
3. Estimates of relevant numbers / development of quantitative models
4. Exposure to current research articles

Learning Prerequisites

Recommended courses

Mathematics and physics courses of the 1st and 2nd years

Learning Outcomes

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

- Elaborate a model of a biophysical phenomena
- Develop hypotheses to simplify a model of a biophysical phenomena
- Solve the mathematics necessary to construct a model of a biophysical phenomena
- Critique the results of a model of a biophysical phenomena
- Apply models to solve problems and applications

Teaching methods

Ex cathedra and exercises in classrooms

Assessment methods

Written exam

Supervision

Others No

Resources

Bibliography

Lectures notes and list of recommended books
Moodle: slides, exercises and their solutions

Ressources en bibliothèque

- Find the references at the Library

Notes/Handbook

- Physical Biology of the Cell, Rob Phillips et al, 2013 Garland Science

Moodle Link

- https://go.epfl.ch/PHYS-301