

PHYS-302

Biophysics : physics of biological systems

Rahi Sahand Jamal

| Cursus | Sem. | Type |
|---------------------------------|----------|------|
| Biomedical technologies minor | H | Opt. |
| Ing.-phys | MA1, MA3 | Opt. |
| Life Sciences Engineering | MA1, MA3 | Opt. |
| Mechanical engineering | MA1, MA3 | Opt. |
| Physicien | MA1, MA3 | Opt. |
| Physics of living systems minor | H | Opt. |
| Physics | | Opt. |

| | |
|----------------------------|---------------------|
| Language of teaching | English |
| Credits | 4 |
| Session | Winter |
| Semester | Fall |
| Exam | During the semester |
| Workload | 120h |
| Weeks | 14 |
| Hours | 4 weekly |
| Lecture | 2 weekly |
| Exercises | 2 weekly |
| Number of positions | |

Summary

Understand and use the results and methods of population genetics, population dynamics, network theory, and reaction network dynamics to analyze and predict the behavior of living systems

Content

Master equation, population genetics, finite populations, genetic drift, stochastic modeling, fluctuating environments

Introduction to networks, dynamics on networks

Biochemical reaction networks, Michaelis-Menten kinetics, cooperativity, autoregulation, feedback and bistability, switches, oscillations, feed-forward loop network motif, stochastic gene expression, causes and consequences of stochastic gene expression, robustness

Keywords

physics of living systems, population genetics, population dynamics, genetic networks, systems biology

Learning Prerequisites**Recommended courses**

physics, mathematics, and biology at the introductory university level

Teaching methods

Flipped classroom, lectures (online and in person), in-person discussions, discussions of research articles, problem solving

Expected student activities

attend lectures, watch online lectures, complete exercises, read and present recent papers in the field

Assessment methods

40% homework, 60% final project

Supervision

Office hours Yes

Assistants Yes

Resources

Moodle Link

- <https://go.epfl.ch/PHYS-302>