BIOENG-420

Single cell biology

D'Angelo Giovanni, Deplancke Bart, Zenk Fides

Cursus	Sem.	Type
Computational and Quantitative Biology		Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Minor in life sciences engineering	E	Opt.

Language of teaching	English
Credits	4
Session	Summer
Semester	Spring
Exam	During the semester
Workload	120h
Weeks	14
Hours	**3 weekly**
Courses	3 weekly
Number of positions	

Summary

The students are exposed to experimental and analytical approaches specific to single cell biology, with an emphasis on quantitative aspects.

Content

Contents:
1. Use of single-cell transcriptomic technologies and analyses in fundamental and biomedical science

2. Dynamic analysis of gene expression, signalling and cell fate choices in single cells

3. Single-cell and Spatial metabolomics to reveal cellular heterogeneity in biology

4. Single-cell Genomics Technologies to study gene regulation

5. Single-cell Multiomics and Data Integration across technologies

6. Mini-Symposium with external Speakers

Keywords

Single Cell Technologies, Multiomics, Metabolomics, Transcriptomics, Genomics

Learning Outcomes

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

- Explain the limitations of bulk analysis that can be overcome by single cell analysis
- Explain the advantages and limitations of single cell analysis in gathering quantitative data
- Explain how single cell analyses can have diagnostic or biomedical value
- Propose experimental approaches to investigate phenotypic heterogeneity in a cell population
- Propose experimental approaches to investigate temporal fluctuations in gene expression
- Propose experimental approaches to investigate cell fate choices and bacterial resistance to drugs at the single cell level

Teaching methods

The course is organized in three main parts, each containing alternating lectures and journal clubs presented by the students in groups or computational exercises. Half-day symposium featuring external and internal speakers.

Assessment methods

50% graded computational exercises and journal clubs
50% Final exam

Resources

Moodle Link

- https://go.epfl.ch/BIOENG-420