

BIOENG-420

**Single cell biology**

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Cursus	Sem.	Type
Bioengineering	MA4	Opt.
Life Sciences Engineering	MA2, MA4	Opt.
Sciences du vivant	MA4	Opt.

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

**Summary**

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

**Content**

The course is organized in four parts, each containing alternating lectures and journal clubs presented by the students in a 1:1 ratio (see Teaching methods below for more details). Part 1 (weeks 1-4) will focus on the fundamental and biomedical research values of single cell genomic and transcriptomic analyses. Part 2 (weeks 5-8) will focus on dynamic analysis of gene expression, signaling and cell fate choices in single cells. Part 3 (weeks 9-10) will focus on engineering approaches to single cell analysis. Finally, part 4 (weeks 11-12) will focus on non-genetic heterogeneity in bacteria and its consequences. Week 13 will consist of a half-day symposium featuring external and internal speakers (week 13) and an oral exam (week 14).

**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

**Assessment methods**

Oral exam during the semester

**Resources****Moodle Link**

- <http://To be determined>