

MICRO-560

**BioMEMS**

Renaud Philippe

Cursus	Sem.	Type
Bioengineering	MA3	Opt.
Biomedical technologies minor	H	Opt.
Electrical and Electronical Engineering	MA1, MA3	Opt.
Life Sciences Engineering	MA1, MA3	Opt.
Microtechnics	MA1, MA3	Opt.
Sciences du vivant	MA3	Opt.

Language of teaching	English
Credits	2
Withdrawal Session	Unauthorized Winter
Semester Exam	Fall Oral
Workload	60h
Weeks	14
<b>Hours</b>	<b>2 weekly</b>
Courses	2 weekly
<b>Number of positions</b>	<b>50</b>

**Il n'est pas autorisé de se retirer de cette matière après le délai d'inscription.**

**Summary**

This course covers the main applications of micro devices for life science and biomedical applications. The course is organized by application topic. It is also covering the basic physical, biological, chemical, technological concepts, which are presented as transversal introductory section

**Content**

Application topics (mini-chapters):

- DNA separation, extraction, amplification
- DNA arrays
- PCR, sequencing
- protein separation, arrays
- immunoassays, lateral flow assays, paper devices, multiplex assays
- Electrochemical sensors
- Impedance biosensors, cell based impedance
- mechanical biosensor
- microelectrode array, neurochips
- dielectrophoresis, electroporation, microflow cytometry, cell sorting
- drug delivery devices
- cell chips, cell arrays

Basic concepts (transversal mini-chapters):

- key numbers
- technologies
- diffusion and dilution limit
- surface tension
- surface chemistries, reaction kinetics
- microfluidics
- electrode model, electrochemistry basics
- cell models
- electrokinetics

**Keywords**

microtechnology  
biosensor  
biomedical

## Learning Prerequisites

### Recommended courses

Capteurs (or equivalent)  
Technologies of microstructures

### Important concepts to start the course

basic knowledge in physics, chemistry

## Learning Outcomes

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

- Illustrate applications of BioMEMS examples
- Design devices for specific applications
- Explain basic principles involved in BioMEMS

## Teaching methods

Course organized in mini-chapters, presented by application topic.  
The basic concepts are presented in between application topics  
Each mini-chapter or basic concept is presented in about 20 minutes, followed by 10 minutes discussion/question session

## Expected student activities

read the basic concepts mini chapter before the class when it will be presented  
reply to some quizz along the course

## Assessment methods

oral exam:

A written question is given to the student, he has 15 minutes for preparation and writing on the question page.  
Then, the oral examination takes 15 minutes

## Supervision

Office hours	Yes
Assistants	No
Forum	No

## Resources

### Bibliography

- Introduction to BioMEMS, Albert Folch, CRC press
- Microfluidics for Biotechnology, J. Berthier & P. Sliberzan (pdf extracts will be available on the Moodle for reading)
- Handbook of Biosensors and Biochips, R. Marks et al., Wiley (pdf extracts will be available on the Moodle for reading)

### Ressources en bibliothèque

- [Introduction to BioMEMS / Folch](#)

- [Handbook of Biosensors and Biochips / Marks](#)
- [Microfluidics for Biotechnology / Berthier](#)

### **Notes/Handbook**

Lecture notes

### **Moodle Link**

- <http://moodle.epfl.ch/course/view.php?id=305>