MICRO-560 **BioMEMS**

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Cursus	Sem.	Type
Bioengineering	MA1, 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	MA1, MA3	Opt.

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

It is not allowed to withdraw from this subject after the registration deadline.

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
- immunuassays, lateral flow assays, paper devices, multiplex asays
- 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 specifics applications
- Explain basic principles involved in BioMEMS

Teaching methods

Course organized in mini-chapters, presented by application topic.
The basic concepts are presented in betwen application topics
Ecach 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 wtritten question is given to the student, he has 15 minutes for preparation and wtring on the question page.
Then, the oral examination takes 15 minutes

Resources

Bibliography

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

Ressources en bibliothèque

- Introduction to BioMEMS / Folch
- Microfluidics for Biotechnology / Berthier
- Handbook of Biosensors and Biochips / Marks

Notes/Handbook

Lecture notes