Summary

Content
Currents and capacitive-effects in water solutions
Introduction to biological molecules
Thermodynamics of molecular Interactions
Nanotechnology for molecular assembly on chip surfaces
Nanotechnology to prevent electron transfer
Nanotechnology to enhance electron transfer
Chip design for electrochemical sensing: basic configurations
Chip design for biosensing with label-free capacitance mode (CBCM & FTCM Methods)
Chip design for biosensing in constant-bias (Current-to-Voltage & FTCC Methods)
Chip design for biosensing in voltage-scan (VDCM & DDSM Methods)

Keywords
OpAmp, CMOS, biosensors, carbon nanotubes, alkane/silane thiols, proteins, DNA

Learning Prerequisites
Recommended courses
Electronics I (BS course)
General chemistry OR Chemistry of surfaces (both BS courses)
Analysis IV (BS course)

Learning Outcomes
By the end of the course, the student must be able to:
• Choose bio materials
• Choose nano materials
• Judge an electrical interface
• Design complex analog circuits for electrochemical biosensing
• Design Bio-Nano-CMOS-sensing devices at system level
• Realize and discuss nanotechnology and molecular layers on chip Investigate
• Discuss biotechnology to Realize biosensors on chip
Teaching methods
Ex cathedra, and exercises

Assessment methods
Written

Supervision
Office hours  Yes
Assistants  Yes
Forum  No

Resources
Bibliography
1. Course slides

Ressources en bibliothèque
• Bio/CMOS Interfaces and Co-Design / Carrara

Websites
• http://people.epfl.ch/cgi-bin/people?id=182237&op=bio&lang=en&cvlang=en