positions

MICRO-614 Electrochemical nano-bio-sensing and bio/CMOS interfaces

Carrara Sandro				
Cursus	Sem.	Туре	Language of	English
Electrical Engineering		Opt.	teaching	Linglish
Microsystems and Microelectronics		Opt.	Credits Session	1
			Exam	Project report
			Workload	30h
			Hours	15
			Lecture	15
			Number of	20

Frequency

Every year

Remark

June 10-14, 2024

Summary

Main aim of the course is to introduce, in designing of modern wearable and implantable devices, the new concept of co-design three system' layers: Bio for Specificity, Nano for Sensitivity, and CMOS for autonomy. Recent examples of devices realised for m-Health are presented and deeply discussed.

Content

- 1. Bio for Probes/Targets building blocks: Proteins and DNA
- 2. Bio for Probes/Targets interactions with DNA and Antibodies
- 3. Bio for Probes/Targets interactions with Oxidases and Cytochromes
- 4. Bio for Detection principles: Dna, Antobodies, Enzimes
- 5. Bio for Detection principles: Redox Reactions
- 6. Nano for Probes immobilization: Methods and Mechanisms
- 7. Nano for Probes layer quality: SPR, SEM, and AFM
- 8. Nano for Memristive Biosensors
- 9. Nano to prevent the Electron Transfer
- 10. Nano to enhance the Electron Transfer
- 11. CMOS for metabolite in fixed voltage
- 12. CMOS for metabolite in scanning voltage
- 13. CMOS for multi-metabolites monitoring
- 14. CMOS for DNA detection
- 15. CMOS for Applications in Animals and Humans Remote Telemetry

Keywords

Wearable Devices; Implantable Chips; mHealth; Nano-Bio-Technology; Carbon Nanotubes; Metallic Nanoparticles; Op Amp; Analog Design; Electrochemical Sensing; CMOS

Learning Prerequisites

Recommended courses

Classical mechanics; Geometrical optics; Electro-magnetism; ohm law on steady current and some theorems on alternate current; Laplace transforms

Assessment methods

Home-works by solving excercises and writing a blog article

Resources

Bibliography Bio/CMOS Interfaces and Co-Design, Sandro Carrara (author), Springer (Editor), 2011

Ressources en bibliothèque

• Bio/CMOS Interfaces and Co-Design / S. CARRARA

Moodle Link

• https://go.epfl.ch/MICRO-614