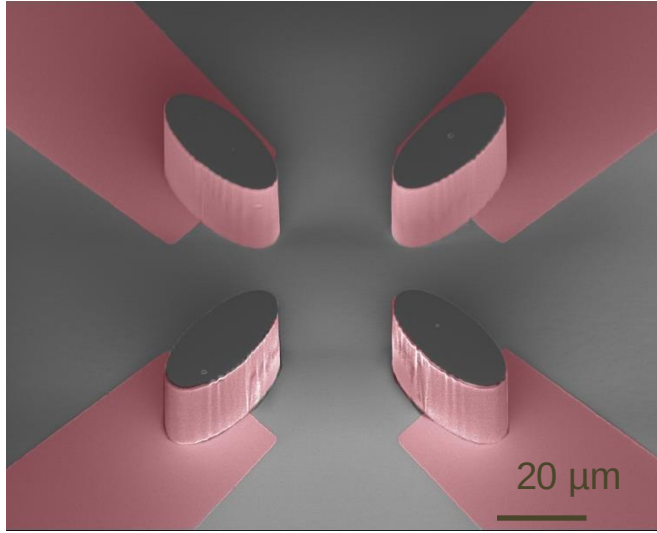




Fundamentals of Biosensors and Electronic Biochips. EE515 EPFL Master

Prof. Carlotta Guiducci
Institute of Bioengineering and Institute of Electrical and Micro-Engineering
Ecole polytechnique fédérale de Lausanne

Introducing myself

Carlotta Guiducci

CLSE. Swiss Up foundation Chair on Engineering. Laboratory of Life Sciences Electronics

Institute of Bioengineering & Institute of Electrical Engineering

BM2106

Ph: +41216937813

carlotta.guiducci@epfl.ch

Office hours: by appointment

Rational of the course (1/2)

- The field of biosensors and biochips covers a wide range of applications such as
 - the detection and analysis of **molecular interactions**, **membrane interactions** and **cells properties**.
 - the sample preparation though separation of biological species and enrichment or amplification of specific targets.
 - the manipulation of biological material at the microscopic and nanoscopic scale.We will discuss the drivers in these fields and the existing limitations.
- The course is intended to present a number of relevant (consolidated or emerging) **biosensing techniques** employed in commercial and research fields and to give insights of the **underlying physical and chemical phenomena**.

Rational of the course (2/2)

- We will discuss specific issue related to the packaging and interfacing techniques to make the sensors compatible with different application environments.
- We want to
 - support you in acquiring the capability of evaluating new biosensors and biochip discoveries and technologies both in terms of the innovative content and their compliance with the application needs.
 - provide you with tools (knowledge/models/math) for the design of experiments and devices.

Structure

- 3 credits
- 2/3 Frontal lecture. 1/3 exercises (Prepare the exercises in advance and discuss them at the exercise session).

Teaching material

- Handouts discussed during the course (available on moodle).
- Exercises text and solutions
- Scientific papers
- Selected material from the following books (available on moodle and at the library):
 - *Intermolecular and Surface Forces*, J. Israelachvili, Academic press
 - *Surface Plasmon resonance Based Sensors*, J. Homola et al., Springer
 - *Surface Design: Applications in Bioscience and Nanotechnology*, R. Forch, H. Schonherr, A.T. Jenkins, Wiley
 - *Bioelectronics: From Theory to Applications*, I. Willner, E. Katz, Wiley

Evaluation

- Written exam (winter session). $\frac{3}{4}$ of the grade. Open book.
- Report and presentation (groups of 4 students). 12-minute presentation per group, 5 minutes questions: Final part of the semester. ($\frac{1}{4}$ of the grade)

Organization of the lectures

- **Lectures:** Wednesday 1:15 pm – 3 pm.
- **Exercises:** Wednesday at 3:15 pm
- We will schedule **group presentations** on the last 2-3 weeks of the course on projects assigned.