

Course content

(1) Introduction and syllabus

Analytical Biosensors

(2) Analytical performance of biosensors

Definition of biosensor and biochips. Examples.

Definitions of performance parameters of a biosensors such as sensitivity, selectivity and limit of detection.

(3) Surface ligand binding biosensors

Fundamental mechanisms and laws that regulate the binding of target molecules to ligands arranged on a surface.

Miniaturization of the sensing area

Peculiarities and effects of scaling the surface size

(4) Assay configurations, matrix-dependent performance

Classifications and configurations of molecular assays

Homogenous and heterogeneous

Direct, sandwich, competition, inhibition assays

Main issues and performance-limiting factors in surface sensing

Techniques for the creation of patterns of molecular ligands on the surface of a sensors- Biosensors arrays

Microfluidics systems

(5) Sensor performance in presence of convection

Physical and biochemical phenomena predominant in microfluidic sensing devices.

How to evaluate the sensing speed and performance of a sensor working in flow conditions.

Applications in Diagnostics

(6) Binary Diagnostic tests (screening assays) and quantitative test

(7) Lab-on-a-chip systems

Micro and nanodevices

(8) Solid-liquid interfaces: Electrodes

Bioanalytics with Electrodes

Cell-electrode interface

Electrical impedance spectroscopy and other electrochemical techniques

(9) Field-effect transistors

Oxide/liquid interfaces

Chemical and biological sensing
Complex systems for Nucleic acid sequencing

Prototyping, packaging and commercialization

(10) Translation and Commercialization of biosensors.

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(11) Certification for biomedical devices

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(12) Microfluidics, electronics and packaging interfaces to bring a biosensor to the end-user

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