

CHEVA 08: ELECTROCHEMICAL SENSOR – FABRICATION AND SENSOR APPLICATIONS

Course Duration : 30 Hours

Session: September to October 2023

Objectives: To know about (i) Fundamental of Electrochemical sensor (ii) Fabrication of Sensor (iii) Testing of Fabricated Sensor (iv) Application of Fabricated sensor



Outcomes: The students would be able to know Fundamental of Electrochemical sensor (ii) Fabrication of Sensor (iii) Testing of Fabricated Sensor (iv) Application of Fabricated sensor will facilitate better understanding sensor applications for further learning.

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COURSE CODE: CHEVA 08	ELECTROCHEMICAL SENSOR – FABRICATION AND SENSOR APPLICATIONS	HOURS 30
Objectives	<p>The objective of the course is to make the students</p> <ul style="list-style-type: none"> • To understand principles and application of modern chemical sensor technology. • To get the ability to operate with existing sensor systems and transducers, as well as to design new sensors, based on application of “smart materials”. • To get familiar with sensor fabrication. • To learn about electrochemical sensors. • To know more about application of sensor in various fields. 	
Unit I	<p>GENERAL PRINCIPLES, DEFINITIONS AND CONCEPTS Introduction to principles of chemical sensing; Signal transduction; Physico-chemical and biological transducers; Sensor types and technologies. Terminology and working vocabulary; Main technical definitions: calibration, selectivity, sensitivity, reproducibility, detection limits, response time; Problems and trade-offs.</p>	
Unit II	<p>PHYSICO-CHEMICAL SENSORS AND TRANSDUCERS Thermal sensors; Electrochemical sensors (amperometric, potentiometric, conductimetric); Semiconductor transducers (ISFET, ENFET); Optical transducers (absorption, fluorescence, bio/chemiluminescence, SPR); Piezoelectric and acoustic wave transducers; Limitations & problems to be addressed.</p>	
Unit III	<p>FABRICATION OF SENSOR Methods for sensors fabrication: self-assembled monolayers, screen printing, photolithography, micro contact printing, MEMS. Engineering concepts for mass production.</p>	
Unit IV	<p>TESTING OF FABRICATED SENSOR Ionic recognition, molecular recognition-chemical recognition agent, spectroscopic recognition, biological recognition agents. Immobilization of biological components, performance factors of Urea sensors, Amino Acid sensors, Glucose sensors and Uric Acid, factors affecting the performance of sensors.</p>	
Unit V	<p>APPLICATIONS OF FABRICATED SENSOR Environmental monitoring; Technological process control; Food quality control; Clinical chemistry; Test-strips for glucose monitoring; Implantable sensors for long-term monitoring; Forensic science benefits; Problems & limitations.</p>	
Outcome	<p>After completion of the course, the students shall be able to</p> <ul style="list-style-type: none"> • To get basic knowledge on principles, definition and concepts of sensors. • To learn about transducers and its role in sensors. 	

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| | <ul style="list-style-type: none">• To get familiar with biochemical sensors.• To get familiar engineering of sensors.• To know about the application of sensors in various fields. |
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Reference and Text Books:

1. Ajit S adanaand Neeti Sadana, (2011). Handbook of Biosensors and Biosensor Kinetics, Elsevier B.V. Amsterdam, The Netherlands. (ISBN: 978-0-444-53262-6)
2. Frieder S chelfer And Florian Schubert, (1992). "Biosensors" Techniques and Instrumentation In Analytical Chemistry -Volume 11, Elsevier Science Publishers B.V. Amsterdam, The Netherlands, (ISBN 0-444-98783-5).
3. Janata J. (2009). Principles of Chemical Sensors. Springer.
4. Jeong-Yeol Yoon, (2016). Introduction to Biosensors: From Electric Circuits to Immunosensors, Springer Int. Publishers (ISBN: 978-3-319-27411-9).
5. Jonathan M. Cooper and Cass A.E.G. (2004). Biosensors: a practical approach, Oxford University press. (ISBN 0-19- 9-63846- 2).
6. Vinod Kumar Khanna, (2011). Nanosensors: Physical, Chemical, and Biological, CRC Press. (ISBN: 978-1-439-82712-3).