ALAGAPPA UNIVERSITY

[A State University Reaccredited with "A" Grade by NAAC]
KARAIKUDI – 630 003.
TAMIL NADU

BIOSENSORS FOR HEALTH CARE

(A Value Added course)

OFFERED BY

DEPARTMENT OF BIOELECTRONICS AND BIOSENSORS

Biosensors and chemical sensors for healthcare applications are garnering interest due to their potential to provide continuous and real-time physiological information, chemical information, and noninvasive measurements of biochemical markers in human biofluids, such as tears, saliva, sweat, interstitial fluid, and human volatiles. Electrochemical biosensors and the monitoring of metabolites, proteins, chemicals, and microbes have been the focus of recent advancements. In healthcare and medicine, the measuring of biophysical bodily parameters has been researched. To monitor pertinent aspects in sports, healthcare, and medicine, numerous flexible, wearable, and detachable sensors have been created and commercialized. The main objective of this course is to make aware of various sensors used in industries to get the students acquainted with the advanced technology used for analysis and actuating the systems in this modern world.

Course Benefits

- Students will learn many important sensors widely being used in health care monitoring.
- They will learn about the usefulness, modernization and time saver sensor modules.
- It will be very helpful while going for designing a sensor, higher studies, research and getting a job in VLSI based industries.

Offered during Holidays/Weekends

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	BIOSENSORS FOR HEALTH CARE
Objectives	The main objective of this paper is to provide basics of biosensors and its role in health care applications
Outcome	On successful completion of the course, a student will be able to • Understanding the principles, working and types of biosensors • Understanding the role of biosensors in various fields • Basic ideas on medical instruments regarding their working and features • Understanding the advancement in medical biosensing like lab on chip, MEMS etc.
Schedule	Teaching Hours: 6 hours per week
Prerequisite	Basic knowledge on biosensors, medical instrumentations, basic chemistry and physics are prerequisite.
UNIT I	**INTRODUCTION TO BIOSENSORS**
	Biosensors- various components of biosensors - biocatalysis based biosensors - Various types of transducers; principles and applications - Calorimetric, Optical, Potentiometric / Amperometric, Conductometric / Resistometric, Piezoelectric, Semiconductor, Impedimetric, Chemiluminiscene - based Biosensors.
UNIT II	**APPLICATION AND USES OF BIOSENSORS**
	Biosensors in clinical chemistry, medicine and health care. Application of enzymes in analysis; design of enzyme electrodes and their application as biosensors in healthcare.
UNIT-III	**TYPES AND CLASSIFICATIONS**
	Enzyme-based biosensors (ELISA) - Antibody-based biosensors - DNA-based biosensors - Multiplexed assays - DNA microarrays - Semiconductor and nanopore sequencing - Single-cell patch-clamp - Immobilization of biomolecules on transducer surfaces - Interfacing sensors with electronics Biocompatibility.
UNIT IV	**BASIC CONCEPTS AND PRINCIPLES OF MEDICAL INSTRUMENTATION**
	Survey of major modalities, techniques, and data interpretation - X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), PET, and SPECT. Electrocardiogram (ECG), Electroencephalogram (EEG), Electromyography (EMG), Surgical Instruments, ENT and Ophthalmic Instruments. Ultrasound Medical Diagnostic Instrumentation.
UNIT-V	**DESIGN OF MATERIALS FOR BIOMEDICAL APPLICATION**
	Working Principle & Application of Smart phones & wearable sensor devices - Heart biomedical signals Textile-integrated non-contact sensors - Long-term monitoring of respiration and pulse by Respiration and pulse bio signals. Flexible Sensors, Conformal Electronics, MEMS, Lab-on-chip

Reference Books

1. Webster, J. G. (ed.), "Medical instrumentation: application and design", Fourth edition, John Wiley & Sons, Hoboken.
2. Dr. Inamuddin, Raju Khan, Ali Mohammad, Abdullah Asiri, "Advanced Biosensors for Health Care Applications", 1st Edition - June 15, 2019.
3. Jyotismita Chaki, Nilanjan Dey, Debashis De, "Smart Biosensors in Medical Care", 1st Edition - February 18, 2020.
4. Zeynep Altintas, "Biosensors and Nanotechnology: Applications in Health Care Diagnostics", 2017.

Mode of Evaluation	Assignment/Seminar/Written Examination