NANOBIO TECHNOLOGY ENABLED POINT-OF-CARE DEVICES

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PRE-REQUISITES : 10+2 (only basic Sciences)

INTENDED AUDIENCE : UG-PG, RS Students, Faculty Members, Industry Professionals, and Medical Professionals.

INDUSTRY SUPPORT : 1) Coromandel International Limited 2) PalmSens 3) Zensor 4) GE Healthcare 5) Greyfalcon Healthcare Private Limited 6) Metrohm

COURSE OUTLINE :

The course addresses the approach of how to develop the portable, reusable, robust, ultrasensitive and efficient point-of-care (POC) systems that has received significant attention in the healthcare system and analytical process and explains the science behind the detection of analyte of interest at the early stage of diagnosis. Students also will learn the techniques of commercialization of diagnostic devices.

ABOUT INSTRUCTOR :

Prof. Gorachand Dutta, PhD is an Assistant Professor with the School of Medical Science and Technology, Indian Institute of Technology Kharagpur. His research interests include the design and characterization of portable biosensors, biodevices and sensor interfaces for miniaturized systems and biomedical applications for point-of-care testing. He received his Ph.D in Biosensor and Electrochemistry from Pusan National University, South Korea, where he developed different class of electrochemical sensors and studied the electrochemical properties of gold, platinum, and palladium based metal electrodes. He completed his Post-doctoral fellowships in the Department of Mechanical Engineering, Michigan State University, USA and Department of Electronic and Electrical Engineering at University of Bath, UK. During his research tenure in USA and UK, Prof. Dutta invented an enzyme- free, disposable miniaturized immunosensor chip using micropatterned electrode and wash-free method for the development of mobile phone-based platforms for fast and simple point-of-care testing of infectious and metabolic disease biomarkers. He has expertise on label-free multichannel electrochemical biosensors, electronically addressable biosensor arrays, aptamer- and DNA-based sensors and surface bio-functionalization. Also his focused areas:(1) integration of biosensors with fuel cell for self-powered biodevices, (2) low-cost, fully integrated biosensor devices using Lab-on-Printed Circuit Board (PCB) approach, (3) enzyme based immunosensor (ELISA), (4) ultra-sensitive biosensors using magnetic bead assays, nanoparticles, CNT, dendrimer, (5) Lab-on-a-Chip devices for biomedical diagnostics, (6) bio-nanotechnology for drug delivery,(7) microfluidics.

COURSE PLAN :

Week 1: Introduction and basic concept of point-of-care diagnosis,Analytical Chemistry with Biological applications and their mechanistic studies in diagnosis: thermodynamics,chemical kinetics, rate constant.
Week 2: Nanobiomaterials: fundamental concept. Nanomaterials for early stage biomarker detection, synthesis and characterization of Nanoparticles and their use for Biosensors and Biodevices, Biofunctionalization of nanomaterials, beneficial properties of nanomaterials for diagnosis.
Week 3: Basic tools used in diagnostics, Signal amplification chemistry for higher signal-to-background ratios: Redox Cycling amplification methods, electrode surface modification with nanomaterials.
Week 4: Lab-on-a-chip devices for biomedical diagnostics, Multiplex diagnostic microsystem development for rapid quantification, Non-Invasive approach, Printed bioelectronics.
Week 5: New detection systems for POCT and integration of highly sensitive Biosensors to mobile devices: Wash-free detection, label-free detection, Lab-on-Printed circuit board.
Week 6: New detection systems for POCT and integration of highly sensitive Biosensors to mobile devices: Wearable biosensors, smart phone-based platform, disposable self- powered POCT Devices.
Week 7: Device characterization and challenges.
Week 8: Commercialization of biosensor and biodevices,environmental field monitoring, food safety, and security.