Module Code	:	SC-4367		
Module Title	:	**Biosensors, Biochips and Nanobiotechnology**		
Type of Module	:	Major Option		
Modular Credits	:	2	**Student Workload : Contact hours for timetabling:**	4-5 hr/week 2 hr/week
Prerequisite	:	None		
Anti-requisite	:	None		

Aims:

Upon successful completion of this course, students are expected to be able to have more in-depth knowledge of various biosensing/bioanalytical/biochips/nanobiotechnology platforms including their transducing techniques. This course will benefit students to decide the most suitable transduction modules to be used for healthcare, food analysis (including Brunei halal branding), traditional and personalized medicine, theranostic, drug discovery, environment, process industries, security and defence etc.

Course Content:

Introduction: Definition, history of Biosensors, Biochips and Nanobiotechnology
Recognition receptors for biosensors: Nucleic acids (DNA/RNA), aptamers (oligonucleotides), enzymes/proteins, antibody/antigen, cell receptors, plastic antibody or molecularly imprinted polymer (MIP).
Biosensor modification and treatment: Surface modification and attachment, entrapment, encapsulation, and cross-linking on various solid surfaces.
Detection methods and signal processing: Electrochemical, optical, thermometric, magnetic, micromechanical etc, label free and label based approaches.
Biosensor design and fabrication (Bioengineering): Classic and novel bioanalytical purposes, screen-printing, photolithography, micro contact printing, BioMEMS. engineering concepts for mass production, nanoparticles, carbon nanotubes (CNTs), quantum dots, graphene.
Sample processing and/or pre-treatment: Food (Raw and processed); Biospecimens i.e. blood, cell, urine, saliva, tissue etc. Microorganisms/Pathogens; Bacteria, virus, etc. Toxin and heavy metals.
Point of care (POC) devices: Lab-on-a-chip and microfluidics interfaces towards µTAS (micro Total Analysis System) development, nanofluidics, DNA and Protein microarray, digital microfluidics. Micro fabricated *in vitro* DNA/RNA amplification (PCR, RT-PCR, Isothermal amplification) strategies, Microfluidics cell analysis and/or sorting..
Data analysis, quality, variability, and bias: Inter and Intra-assays analytical challenges, signal to noise ratio, normalization/optimization and signal retrieval. Data quality, variability and bias and its interpretation.
Application of biosensors and future outlook: Healthcare, food security, environmental, process industries, security and defense etc.

Assessment:	Examination: 70%	Coursework: 30% The continuous assessment is based on 3 assignments (15%) and 3 tests (15%)