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| **Course code** | **Course name** | **Course Category** | **L-T-P** | **Credits** |
| 22BEXY05 | Biosensors and Bioelectronics | Open free elective | 3-1-0 | 4 |

**Biosensors and Bioelectronics**

**Course Learning Objectives:**

1. To understand the use of biomolecues as recognition elements for detection of a particular analyte and the use of biological elements such as proteins in place of silicon chips and learn the basic concepts in biosensing and bioelectronics
2. To be able to understood and learn transducers in biosensors
3. To be able to solve typical problems in biosensing and applications and learn about the remaining challenges in this field
4. To learn biomolecutes and functioning concept
5. To learn basic concepts of developments towards biomolecular computer
6. To be able to understood commercial prospects for biomolecular computing system.

**Course Content:**

**Unit- I: Introduction of Biosensors (6 hours)**

Advantages and limitations, various components of biosensors Biocatalysis based biosensors, Bioaffinity based biosensors & Microorganisms based biosensors, Biologically active material and analyte. Types of membranes used in biosensor constructions.

**Unit- II: Transducers in biosensors (6 hours)**

Various types of transducers; principles and applications - Calorimetric, Optical, Potentiometric / Amperometric, Conductometric / Resistometric, Piezoelectric, Semiconductor, Impedimetric, Chemiluminiscene - based Biosensors.

**Unit- III: Application and uses of biosensors (9 hours)**

Biosensors in clinical chemistry, medicine and health care, biosensors for veterinary, agriculture and food Low cost - biosensor for industrial processes for online monitoring; biosensors for environmental monitoring. Application of enzymes in analysis; design of enzyme electrodes and their application as biosensors in industry, healthcare, food and environment.

**Unit- IV: Molecules of life (9 hours)**

Monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

**Unit-V:** **Bioelectronics (9 hours)**

Potential advantages & Developments towards a biomolecular computer, development of molecular arrays as memory stores; molecular wires and switches; mechanisms of unit assembly.

**Unit -VI: Design for a biomolecular photonic computer (6 hours)**

Assembly of photonic biomolecular memory store; Information processing; commercial prospects for biomolecular computing systems.

**Learning Resources**

**Text Book:**

1. Brian R Eggins – ‘*Biosensors an Introduction’*, First edition, John Wiley & Sons
2. Publishers, 1996.
3. Loic J Blum, Pierre R Coulet – ‘*Biosensors Principles and Applications’*, First edition, Marcel Dekker,Inc, 1991.
4. Donald G. Buerk – ‘*Biosensors Theory and Applications’*, First Edition Technomic Publishing. Co, Inc, 1993.

**Reference Books:**

1. Elizabeth A Hall – ‘*Biosensors*’, First Edition, Open University, Milton Keynes, 1990.
2. Graham Ramsay – ‘*Commercial Biosensors’*, First edition, John Wiley & Sons, Inc. 1998.
3. Tran Minh Canh – ‘*Sensor Physics & Technology – Biosensors’*, First Edition, Champan & Hall, 1993.

**Course Outcomes:** At the end of the course, the student will be able to

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| CO 1 | Understood the sources and use of electrical fields and currents in the context of biological systems and problems are discussed. |
| CO 2 | Solve problems related to the biosensing techniques and their physical concepts are introduced in a quantitative fashion. |
| CO 3 | Applied their gained knowledge and understanding for human welfare  |
| CO 4 | Good understanding on biomolecules and their function |
| CO 5 | Better understanding of bioelectronics basic concept and application |
| CO 6 | Well understanding on basics and commercialization of biomolecular computing syatem.  |

**For Theory courses only:**

**Assessment Method**

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| Assessment Tool | Monthly tests | End Semester Test | Total |
| Weightage (%) | 40% | 60% | 100% |