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| **Name of The Course** | **Biology for Engineers** | | | | |
| **Course Code** | BBS01T1008 | | | | |
| **Prerequisite** |  | | | | |
| **Corequisite** |  | | | | |
| **Antirequisite** |  | | | | |
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**Course Objectives:**

Students will understand about the different dimensions ofBio Systems engineering in the field of healthcare and clinical practices.

**Course Outcomes:**

After completion of this course work students able to

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| --- | --- |
| CO1 | Understand about cell, tissue, organ and systems |
| CO2 | Understand functioning of various systems of human body |
| CO3 | Analyse the Measuring & Recording Instruments for recording vital parameters in diagnosis |
| CO4 | Understand and examine the role of Monitoring Instruments in clinical practices |
| CO5 | Demonstrate the capability of the modern imaging systems for diagnostic applications |
| CO6 | Evaluate the applications of Medical devices for Therapy and Prosthetic in biosystems |

**Course Contents**

|  |  |
| --- | --- |
| **Unit-1: Cell and Molecular Biology** | **7 hours** |
| Cell membrane structure and Intracellular compartments, Macromolecules: Structure,  Shape and Information, Introduction to the central Dogmaof information transfer. |  |
| **Unit 2–: Physiology** | **13 Lectures** |
| ***Digestion-*** Physiology of digestion, regulation of food intake and digestive secretions. ***Coordination*** - Structure of Brain and Neurons; Physiology of nerve impulse conduction, excitability of membranes, electrical and chemical transmission between cells. ***Cardiovascular System*** - Physiology of blood – compositions & structure, coagulation; Heart: beat, initiation, conduction and regulation; Physiology of Circulation. ***Respiration and Excretion-*** Physiology of respiration; Exchange and transport of gases and its regulation. Physiology of Excretion, Fluid and electrolytes balance, Acid Base balance. Roles of kidney in body water regulation. |  |
| **Unit-3Biopotentials** | **6 hours** |
| Resting potential, action potentials, synaptic potentials, Exhitatory Post Synaptic Potentials (EPSP) Inhibitory Post synaptic Potentials (IPSP), interaction of signals and Bioelectric signals ECG, EMG, EEG, and its generation and propagation |  |
| **Unit-4Patient Recording and Monitoring Instruments** | **7 hours** |
| Recording Electrodes, Electrocardiograph, Electroencephalograph, Electromyograph Patient Monitoring Systems, Foetal Monitoring Instruments, Oximeters, Blood Flowmeters, Pulmonary Function Analysers, Blood Gas Analysers, Blood Cell Counters, Audiometers and Hearing Aids, |  |
| **Unit-5 Modern imaging systems and Advances in Healthcare** | **6hours** |
| X**-**ray, X-ray Computed Tomography, Nuclear Medical Imaging Systems, Magnetic  Resonance Imaging System, Ultrasonic Imaging Systems. |  |
| **Unit-6Advances in Healthcare** | **6hours** |
| Tissue engineering as therapeutics, electromagnetic therapy, bio ceramics, microrobots and nanobots, Biomaterials, Radiotherapy, Ultrasound Enhanced Nano medicine, and targeted drug delivery, Automated Drug Delivery Systems Artificial skin, limb, advancement in prosthetics, Biocompatibility of artificial organs |  |

**Suggested Readings:**

1. Introduction to Biomedical Engineering by John Enderle, Susan Blanchard and Joseph

Bronzino,Academic Press ELSEVIER

(2) Tissue Engineering by Clemens van Blitterswijk (Editor),Peter Thomsen (Editor),Jeffrey

Hubbell (Editor),RanieriCancedda (Editor),Joost de Bruijn (Editor),Anders Lindahl

(Editor),JeromeSohier (Editor),David F. Williams (Editor), Academic Press

(3) Molecular Cell Biology by Harvey Lodish (Author),David Baltimore (Author),Arnold Berk (Author),W H Freeman & Co (Sd)

(4) Cell Biology & Molecular Biology by N. Arumugam, Saras Publication

**Reference Books:**

(1) Medical Physics by John R. Cameron and James G. Skofronick,John Wiley & Sons, NY

(2) Handbook of Biomedical Instrumentation by R. S. Khandpur, Tata McGraw- Hill

(3) Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011

**Course outcomes and Program outcomes mapping**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO/PO Mapping** | | | | | | | | | | | | |
| (S/M/W indicates strength of correlation) S-Strong, M-Medium, L-Low | | | | | | | | | | | | |
| Cos | Programme Outcomes(POs) | | | | | | | | | | | |
| PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|  |  |  |  |  |  |  |  |  |
| CO1 | 2 |  |  |  |  |  |  |  |  |  |  | 1 |
| CO2 | 2 |  |  |  |  |  |  |  |  |  |  | 1 |
| CO3 | 2 |  |  |  | 2 |  |  |  |  |  |  | 1 |
| CO4 | 2 |  |  |  | 2 |  |  |  |  |  |  | 1 |
| CO5 | 2 |  |  |  | 2 |  |  |  |  |  |  | 1 |
| CO6 | 2 |  |  |  | 2 |  |  |  |  |  |  | 1 |

**Continuous Assessment Pattern**

|  |  |  |  |
| --- | --- | --- | --- |
| **Internal Assessment (IA)** | **Mid Term Test (MTE)** | **End Term Test (ETE)** | **Total Marks** |
| 20 | 30 | 50 | 100 |