

DEPARTMENT OF ZOOLOGY**SZOOVAC01 - Bio- Medical Instrumentation****Learning Objectives**

- To understand the basic structural and functional elements of human body
- To learn separation technique for biomolecules
- To learn bio-electric and bio-potential
- To learn imaging instruments

Course outcomes

At the end of the semester students will be able to

- Understand the structure and physiological functioning of various organ systems of human body
- Master the common bio-separation techniques used for clinical applications
- Operate various medical equipment's working on the principles of bio-electric potentials
- Understand the basic principles and operations of various imaging equipment's used
- in the clinical field
- Take up jobs in various clinical labs, hospitals and related institutions

Unit I Basic Elements of human Body

Cell Structure and organelles – Functions of each component in the cell. Cell membrane- transport across membrane – origin of cell membrane potential – Action potential. Human physiological systems of the body –Structure of heart – properties of Cardiac muscle-Conducting system of heart –Cardiac cycle- Structure of a Neuron – Types of Neuron –Synapses and types-conduction of action potential in neuron – Respiratory system – Components of respiratory system –Respiratory Mechanism- Types of respiration – Oxygen and carbon dioxide transport and acid base regulation – problems encountered in biomedical measurements.

Unit II Separation techniques for Bio-molecules

Electrophoresis Principles, methods and application of paper, Cellulose and immune electrophoresis, Poly Acrylamide. Gel Electrophoresis. Chromatography Principles, methods and application of paper chromatography, thin layer chromatography (TLC), Gas chromatography (GC) Gas liquid chromatography (GLC), High performance liquid chromatography (HPLC), Ion-Exchange chromatography.

Unit III Bio-Electric Potentials

Resting and action potentials – Propagation of action potentials – Bioelectric potentials – Electrocardiogram (ECG) – Electroencephalogram (EEG) – Electromyogram (EMG) Electroretinography (ERG) – Electrooculography (EOG).

Unit IV Bio- Potential Electrodes

Biopotential Electrodes – Types of Electrodes- Microelectrodes – Body surface electrodes – Depth and Needle electrodes –Chemical electrodes – Distortion in measured bioelectric signals using electrodes – Electrode paste.

Unit V Imaging Equipment's

Ultrasonic imaging – Reflection –Scattering-A mode display-B mode display – T-M mode display-Ultrasonic imaging instrumentation – Biomedical applications. Magnetic Resonance imaging (MRI)- Principles – Instrumentation – Advantages of MRI over other medical imaging techniques – Thermography- Endoscopy.

Text Books and References:

Biomedical Instrumentation, T.Rajalakshmi, First Edition, 2008.

Farr's Physics for Medical imaging, Penelope Allisy, Rpberts, Jerry R.Villiams, Saunders, Elsevier, Second Edition, 2008.

Handbook of biomedical instrumentation, R.S. Khandpur, 2007.

Nuclear Medicine physics, Ramesh Chandra, 5th Edition, Lea and Febiger.

The physics of Radiation Therapy, Fiaz M. Khan, 2006.