

**Learning Outcomes:**

After successful completion of the course, student will be able to understand:

- Resting membrane potential and action potential and their importance
- Propagation of an action potential in nerve fibers
- Neuromuscular junction
- Cell contractile mechanism

**SYLLABUS**

<b>Unit No.</b>	<b>Topics</b>	<b>Lectures (Hours)</b>
<b>1</b>	Biophysics Relationships, Resting Membrane potentials, ionic compositions, Nernst Potential, Nernst- plank's equations, Ficks law, Ohms law, Einstein Relationship, Donnan Equilibrium; Goldmann equation; Role of chlorine ion at rest	<b>7</b>
<b>2</b>	Membrane potentials and Action potentials, Basic physics of membrane potentials, Measuring the membrane potentials, origin of resting membrane potentials including Na-K pump, Nerve Action potential including voltage gated channels, Propagation of action potentials in nerve fibers. Dependence of membrane potential on distance	<b>8</b>
<b>3</b>	Equivalent circuit model for the cell membrane (Three ions), Parallel conductance model, Hodgkin Huxley model and related equations. Voltage clamp experimental setup and results.	<b>6</b>
<b>4</b>	Skeletal, Smooth and cardiac muscles, structure, contractile mechanisms and action potentials, Neuromuscular junction: Physiological process of signal transmission, Role of Acetyl choline	<b>6</b>
<b>5</b>	EMG and ENG: Reflex arc, Measurement of conduction velocity, Field potentials of sensory nerves, Reflexed evoked field potentials, Motor unit action potentials. Study of electrical activity of normal and diseased muscles, Saccadic eye movement	<b>6</b>

- 6 Basic Instrumentation scheme for Bio signals ECG, EEG, EMG, EOG, and ERG; Design of a differential Bio-potential Amplifier, Instrumentation amplifier; Transfer function representation; Filters; Frequency response and noise reduction; Frequency aliasing. A to D conversion **10**

**Term Work and Practical shall be based on the above syllabus.**

**Text Books:**

1. Bioelectricity: A Quantitative Approach by R.D. Barr and R.L.Plonsey.  
Pub: Plenum Publications, Newyork.
2. Medical Instrumentation: Application and Design by John. G. Webster  
Pub: Wiley-india Edition
3. Handbook of biomedical and instrumentation by R.S. Khandpur  
Pub: Mc. Graw Hill Inc. New delhi

**Reference Books:**

1. Textbook of Medical physiology by Guyton and Hall  
Pub: Elsevier Saunders
2. Introduction to biomedical equipment and technology by Carr & Brown  
Pub: Pearson Education Inc.
3. Medical Instrumentation Application and Design by John G. Webster.  
Pub: Wiley and Sons Inc. New York.