

Educational Objectives

1. This course gives an overall cellular physiological introduction to the ion channels which are the working tools of neurotransmission. This course shall cover the molecular and cellular mechanisms of neuronal and other tissues communication through ion channels. Correlation of properties of ion channels and synaptic transmission with their physiological functions, such as, neurotransmission, learning and memory will be discussed. This course shall help graduate students to be familiar with ion channels and pursue their research carrier in cellular physiology. This course shall give knowledge to students for the interpretation of the genetic alterations and their consequent diseases.

Course Outcomes

2. Understandings of the physiological functions of neural membrane and their application at the network and memory level.

3. **Course Contents**

- (1) Neurons and its polarity
- (2) Ionic gradients, membrane potential and ionic currents
- (3) Action potentials
- (4) The voltage-gated channels of sodium (Na^+)
- (5) Potassium channels and their types
- (6) The voltage-gated channels of Ca^{2+}
- (7) The ionotropic nicotinic acetylcholine receptors
- (8) The ionotropic GABA_A receptor
- (9) The ionotropic glutamate receptors
- (10) Calcium-release activated calcium (CRAC) channels
- (11) Transient Receptor Potential channels (TRPC)
- (12) Ryanodine receptors
- (13) Cyclic nucleotide-gated ion channel

(14) ATP-gated P2X Receptor channels

Recommended Books

Text book:

1. Cellular and Molecular Neurophysiology, 3rd Edition
(Author: Constance Hammond Release Date: 06 Feb 2008)

Reference book:

2. **Principles of Neural Sciences:** (Eric Kandel, James Schwartz, Thomas Jessell)
Third Edition 2000
3. **Neuroscience: (Dale Purves):** Third Edition 2004
4. **Molecular biology of the cell:** by Bruce Alberts et al. Garland Science. 5th Edition.
5. **Basic Neurochemistry: Molecular, Cellular and Medical Aspects.** 6th edition.