Announcements
The first meeting will be an introductory lecture on Friday, Aug 4, at 9.00 AM in the CNS Lecture Hall (First floor)

Brief description of the course
This course is suitable for all that are interested in having a fundamental understanding of nervous system development, organization, maintenance and function. Major topics covered include the molecular basis of neuronal development, neuronal transmission, synaptic organization and its relationship to synaptic physiology, small animal behavior, learning and memory and neurological disorders.

Prerequisites
None

Syllabus
Module 1: Developmental Neuroscience

Neuro-anatomy

Neural induction, polarity and segmentation

Neural Stem cells, cell cycle, neurogenesis, cell migration
Cellular determination and differentiation

Axon growth and guidance

Target selection

Cell death in the nervous system - Neurotrophins, Caspases,

Synapse formation and function

Dendritic development

Refinement of synaptic connections

Gliogenesis 1 - Astrocytes: Genesis, role in synapse formation, elimination

Gliogenesis 2 - Oligodendrocytes: Genesis, myelination

Module 2: Synaptic Transmission

Modes of Neuronal Communication

Chemical Neurotransmission

Classical neurotransmitters-1

Classical neurotransmitters-2

Non-classical Neurotransmitters

Molecular biology of Neurodegenerative Diseases 1

Molecular biology of Neurodegenerative Diseases 2

Module 3: Synaptic Physiology

Regulation of membrane potential

Neuronal excitability
Module 4: Techniques in Molecular and Cellular Neuroscience

Anatomical planes of study
Identification of gene expression - immunostaining and in situ hybridization
Methods for gene deletion and silencing for functional studies
Generation of transgenic and knockout mice
Quantitative microscopy

Module 5: Learning and Memory

Brief History of Memory
Associative and Non- Associative Learning
Rules of Association -I (Pavlovian Conditioning)
Rules of Association -II (Instrumental Conditioning)
Rescorla Wagner Equation and its Variants
S-S, S-R theories of Learning
Molecular basis of Associative Learning
Synaptic Plasticity: LTP, STDP
Transcription Factors and kinases involved in plasticity
Modern Studies in Learning and Memory
Course outcomes
Students will get a fundamental understanding of nervous system structure, development, neurotransmitter systems, synaptic plasticity, learning and memory.

Grading policy
Tests and/or assignments are given after each module. 20% for each module test.

Assignments

Resources
Lecture notes will be shared.

The suggested text books are: