Syllabus:

Single Neuron Modeling: Ion flux in membranes, Nernst Planck Equation, Ion-Channels, Excitable membranes, Membrane Biophysics, Spiking, Hodgkin Huxley models, Nonlinear dynamics, Integrate and Fire Neurons and others

Neural Encoding and Decoding: Spike train statistics, Sensory systems, Receptive fields, Linear and Nonlinear models of Receptive fields, Applications of Information Theory in neural coding and decoding, Population Coding, Networks

Plasticity: Adaptation and Learning: Synapses: structure and function, plasticity, Spike Timing Dependent Plasticity (STDP), Learning rules, Supervised and Unsupervised Learning, Classical conditioning, Reinforcement Learning

Text Book:

Theoretical Neuroscience - Computational and Mathematical Modeling of Neural Systems by Peter Dayan and L.F. Abbott

Reference Books:

Biophysics of Computation by Christof Koch

Ion Channels of Excitable Membranes by Hille

Methods in Neuronal Modeling by Segev

Principles of Neural Science by Kandel and Schwartz

Neuronal Dynamics by Gerstner