The synapse is a functional unit of the nervous system. We will first explore the biology of excitatory and inhibitory synapses, focusing on local plasticity rules, developmental origins of neuronal sub-types and mechanisms that govern their circuit integration. Then we will address the design principles and plasticity of neuronal circuits and how they encode behavior. Synaptic and neuronal network activity readout strategies will be discussed in detail.

The synapse is also a fundamental information-processing unit whose functional properties are altered in a plethora of neuropsychiatric disorders. With this background, we will try and understand how neuronal wiring principles and functional properties are altered in neuropsychiatric disorders. We will also discuss how this knowledge can be used to better understand, diagnose and design therapeutics for psychiatric and neurological disorders.