Course Title: Molecular and Cellular Physiology

Course Description:
This course aims to provide students with an understanding of the cellular and molecular mechanisms that underlie physiological processes and their dysfunctions. The course will cover various topics related to cellular and molecular physiology, including homeostatic control, intercellular communication, synaptic transmission, ionic channels and receptors, sensory perception, neuron-glia interaction, and neuro-hormonal communication. The course will also include student project works, which will allow students to apply their knowledge and skills to a research project.

Week 1 (Oct 10 – Oct 12): 4h
Tuesday, 4-6 pm: Introduction to the course, homeostatic control, positive and negative feedback Cellular and molecular bases of intercellular communication - synaptic paracrine and hormonal
Thursday, 4-6 pm: Ion channels and transporters

Week 2 (Oct 16 – Oct 18): 8h
Monday, 4-6 pm: Voltage gated Ion channels
Wednesday, 4-6 pm: Ionotropic Receptors (ACh and Gaba)

Week 3 (Oct 23 – Oct 25): 12h
Monday, 4-6 pm: Student project works. Q&A
Wednesday, 4-6 pm: Ionotropic Receptors (Glu). Metabotropic Receptors

Week 4 (Oct 30): 14h
Monday, 4-6 pm: Synaptic transmission – molecular determinants of electrical neurotransmission

Week 5 (Nov 20 – Nov 22): 18h
Monday, 4-6 pm: Student project works. Q&A
Wednesday, 4-6 pm: Synaptic transmission – molecular determinants of chemical neurotransmission

Week 6 (Nov 27– Nov 29): 22h
Monday, 4-6 pm: Short and long term synaptic plasticity
Wednesday, 4-6 pm: Channelopathies of cardiac muscle (long QT syndrome), skeletal muscle (myasthenia), epileptic and ALS associated channelopathies

Week 7 (Dec 4 – Dec 6): 26h
Monday, 4-6 pm: Neuronal chloride homeostasis: membrane transporters and their regulation during development and epilepsy – depolarizing GABA
Wednesday, 4-6 pm: Student project works. Q&A

Week 8 (Dec 11 – Dec 13): 32h
Monday, 4-6 pm: Neuron-glia interaction in CNS functions: Glial cells
Wednesday, 4-6 pm: Astrocytes

Week 9 (Dec 18 – Dec 20): 36h
Monday, 4-6 pm: Neuron-glia interaction in CNS functions: astrocytic functions, tripartite synapse

Wednesday, 4-6 pm: Student project works. Q&A

Week 10 (Jan 8 – Jan 10): 40h
Monday, 4-6 pm: Neuron-glia interaction in CNS functions: microglia
Microglial functions, microglial involvement in synaptic remodeling
Wednesday, 4-6 pm: Microbiota gut brain axis

Week 11 (Jan 15 – Jan 17): 44h
Monday, 4-6 pm: Student project work presentations
Wednesday, 4-6 pm: Student project work presentations

Week 12 (Jan 22 – Jan 24): 48h
Monday, 4-6 pm: Student project work presentations
Wednesday, 4-6 pm: Student project work presentations Course review and final remarks