Syllabus

1. Course title, style, and credit
Systems Neuroscience II
(✓) Lecture ( ) Discussion ( ) Practice
1 credit

2. Appropriate grade level and eligible departments
(✓) D1, (✓) D2, (✓) D3, (✓) D4, (✓) D5
(✓) Department of Physiological Sciences, School of Life Science

3. Lecturers
Norihiro Sadato [sadato@nips.ac.jp, NIPS (Myodaiji)]
Masaki Isoda [isodam@nips.ac.jp, NIPS (Myodaiji)]
Atsushi Nambu [nambu@nips.ac.jp, NIPS (Myodaiji)]
Keiichi Kitajo [kkitajo@nips.ac.jp, NIPS (Myodaiji)]
Takemura Hiromasa [htakemur@nips.ac.jp, NIPS (Myodaiji)]
Kenta Kobayashi [kobaya@nips.ac.jp, NIPS (Myodaiji)]

4. Time
April 22; May 13, 20, 27; June 3, 10, 17,24,; July 1; 2022
AM 10:00-11:30

5. Place
Lectures will be delivered online using Zoom.

6. Prerequisites and styles
Each lecture begins with a basic introduction, so that students can understand the content without specialized knowledge. Therefore, there is no lecture course that must be completed in advance. All lectures will be given in English.

7. Contents
This lecture course gives comprehensive explanations on and analytical methods of the structure and function of the central nervous system, with a primary focus on the cerebral cortex, basal ganglia, and cerebellum, in order to understand higher brain functions at the system level. In the 1st lecture, we will introduce the latest findings on the neural substrates

of social cognitive functions, which are mainly obtained from functional MRI studies. In the 2nd lecture, we will introduce in vivo structural analysis using structural MRI. In the 3rd and 4th lectures, we will focus on the anatomical, physiological, and psychological bases/correlates of visual perception. In the 5th and 6th lectures, we will review cortico-basal ganglia-cerebellar mechanisms underlying the control of voluntary movements in physiology and disease. In the 7th lecture, we will introduce genetic approaches to brain functions. Finally, in the 8th and 9th lectures, we will explain cutting-edge approaches, such as mathematical modeling, information theory, complex network analysis, and machine learning, to understand the operating principles of integrative brain functions such as motor and cognitive functions as well as brain disorders.

8. Course objectives:

(1) To understand the neural basis of social cognition.
(2) To understand brain science studies with structural MRI
(3) To understand the neural basis of visual perception.
(4) To understand the neural basis of motor control.
(5) To understand brain science studies with genetic approaches
(6) To understand the detail and significance of cutting-edge methodologies to probe for the operating principles of the brain.

9. Schedule:

(1) April 22, 2022
“Social cognition”
Norihiro Sadato (Div. Cerebral Integration)
(2) May 13, 2022
“In vivo structural brain analysis using MRI”
Hiromasa Takemura (Div. Sensory and Cognitive Brain Mapping)
(3) May 20, 2022
“Anatomy, physiology and psychology of visual perception (I)”
Taihei Ninomiya (Div. Behavioral Development)
(4) May 27, 2022
“Anatomy, physiology and psychology of visual perception (II)”
Atsushi Noritake (Div. Behavioral Development)
(5) July 3, 2022
“Motor control by cerebral cortex, basal ganglia, and cerebellum: physiological conditions”
Atsushi Nambu (Div. System Neurophysiology)

(6) July 10, 2022

“Motor control by cerebral cortex, basal ganglia, and cerebellum: disease conditions”

Atsushi Nambu (Div. System Neurophysiology)

(7) July 17, 2022

“Genetic approaches for the analysis of brain functions”

Kenta Kobayashi (Sect. of Viral Vector Development])

(8) June 24, 2022

“Neural basis of movement, cognition and their disorders from EEG and fMRI-network perspectives”

Kazumasa Uehara (Div. Neural Dynamics)

(9) July 1, 2022

“A computational neuroscience approach to clarifying the operational principles of brain information processing”

Keiichi Kitajo (Div. Neural Dynamics)

10. Lecture materials and suggested readings

None.

11. Grades

The following three conditions must be met to get credit:

(1) Students attend at least half of the lectures.

(2) Students choose one of the lectures and write an essay report summarizing the lecture content with 750-1500 English words.

(3) Students submit the essay report by the deadline specified later.

The grade is determined on the basis of the quality of the submitted report, which is indicated by A (corresponding to score 80-100), B (70-79), C (60-69), or D (less than 60); A, B or C is ‘passed.’

12. Other notes

None.