SOKENDAI

Course title	Fundamental Neuroscience 2		
Term	後期 2nd Half		
Credit(s)	1		
The main day		The main period	
Program/Department	48 Physiological Sciences		
Lecturers	Yone, Onode, Higashij, Kubot, Yamag, Narush, Nemo, Enok		
成績評価区分 Grading Scale	A, B, C, Dの4段階評価 Four-grade evaluation		
レベル Level	Level 3		
力量 Competence	専門力 Academic expertise、独創性 Creativity		

Instructor

Full name
* NEMOTO　TOMOMI
HIGASHIJIMA　SHINICHI
NARUSHIMA　MADOKA
ENOKI　RYOSUKE
YONEDA　TAISUKE
YAMAGUCHI　HIROSHI
ONODERA　KOUN

Outline	This course provides an overview of neuronal development and circuit formation mechanisms, synaptic plasticity and remodeling dependent on neural activity, developmental homeostasis, the mechanisms underlying biological rhythm generation, and various imaging methodologies, all aimed at understanding functional development and plasticity in the brain.
Learning objectives	Understand the neural mechanisms underlying sensory functions. Comprehend the diversity of neurons and their synaptic connectivity properties. Gain insight into the functions of the hypothalamus. Understand the mechanisms of biological homeostasis. Explore the neural basis of biological rhythms. Acquire knowledge of fluorescence imaging techniques for brain function analysis.
Grading policy	Attendance of at least half of the lectures is required, and achievement of the course objectives will be assessed through reports.
Lecture Plan	Class Schedule and Time: Fridays from 10:00 to 11:30 AM, November to December 2025, as outlined in the course schedule below. 1. Taisuke Yoneda, Function and developmental plasticity of visual system 2. Koun Onodera, Function and developmental plasticity of auditory system 3. Shinichi Higashijima, Auditory and Vestibular System in vertebrates, fish escape circuits 4. Yoshiyuki Kubota, Neuron diversity and microcircuitry of cortex 5. Hiroshi Yamaguchi, Mechanisms of Innate Behavior Control by the Hypothalamus 6. Madoka Narushima, Mechanisms of homeostatic maintenance and remodeling of neuronal circuits 7. Tomomi Nemoto, Basics and applications of visualization analysis of neural functions 8. Ryosuke Enoki, Neural basis of biological clock
Location	Zoom-online or in-person lectures (Lecture Room on the 1st floor of the National Institute for Physiological Sciences, Meidai-ji Campus, or Seminar Room B on the 9th floor of Building 3, Yamate Campus).
Language	English
Textbooks and references	Onodeta: Schnupp, Jan, Israel Nelken, and Andrew J. King. "Auditory Neuroscience: Making Sense of Sound." MIT Press, 2012. Persic, Dora, et al. "Regulation of Auditory Plasticity during Critical Periods and Following Hearing Loss." Hearing Research, vol.397, 2020, p.107976, doi: 10.1016/j.heares.2020.107976 Nemoto: Peter Luu, Scott E. Fraser & Falk Schneider, " More than double the fun with two-photon excitation microscopy",Communications Biology volume 7, Article number: 364 (2024) Narushima: Kandel ER, Koester JD, Mack SH, and Siegelbam SA, "Principles of Neural Science(6th Edition).Part VII: Development and the Emergence of Behavior, Chapters 48-50" McGraw Hill Education, ISBN 978-1-259-64223-4 Duffy AS, Eyo UB. "Microglia and Astrocytes in Postnatal Neural Circuit Formation." Glia. 2025 Feb;73(2):232-250. Demmings MD, da Silva Chagas L, Traetta ME, Rodrigues RS, Acutain MF, Barykin E, Datusalia AK, German-Castelan L, Mattera VS, Mazengenya P, Skoug C, Umemori H. "(Re)building the nervous system: A review of neuron-glia interactions from development to disease." J Neurochem. 2025 Jan;169(1):e16258. Yoneda: Kandel ER, Koester JD, Mack SH, and Siegelbam SA, "Principles of Neural Science(6th Edition). Part VII: Development and the Emergence of Behavior, Chapters 49" Enoki: Hastings M, Maywood E, Brancaccio M, "Generation of circadian rhythms in the suprachiasmatic nucleus" Nat Rev Neurosci., 2018, 19(8):453-469. doi: 10.1038/s41583-018-0026-z Enoki R, Kon N, Shimizu K, Kobayashi K, Hiro S, Chang CP, Nakane T, Ishii H, Sakamoto J, Yamaguchi Y, and Nemoto T. Cold-induced suspension and resetting of Ca2+ and transcriptional rhythms in the suprachiasmatic nucleus neurons. iScience, 2023. Doi: 10.1016/j.isci.2023.108390.
Notes for students of other programs	Students from courses other than the Physiological Sciences course should contact the Graduate School Office at the National Institute for Physiological Sciences (sokendai-adm@nips.ac.jp) before enrolling.
Related URL	https://www.nips.ac.jp/graduate/curriculum.html
Explanatory note on above URL	Please check the Physiological Sciences course website for the latest schedule.
Others	This course is highly recommended for first- and second-year doctoral students in Physiology. Students from other programs are also encouraged to enroll.
Contact for Course Inquiries	Tomomi Nemoto (tn@nips.ac.jp)