Principles of Brain and Cognitive Sciences (339.501)

Description:
The main goal of this course is to provide the basic background that is necessary for graduate students to pursue various neuroscience projects in the Department of Brain and Cognitive Sciences (BCS). This course will first introduce the fundamental principles of the nervous system. The course will then introduce how different systems in the brain function based on these functional and structural principles. Examples of the neural systems covered in this course will be the sensory systems, motor systems, and learning and memory systems, to name a few. Topics covered in the course will be taught by BCS faculty who have expertise in the area of research.

Textbook:
Neuroscience: Exploring the Brain (3rd Edition, by Mark Bear, Barry Connors, and Michael Paradiso)

Reading materials:
Science: Conjectures and Refutations (by Karl Popper)
Other selected journal articles and reading materials.

Grading criteria (total 100%):
attendance (10%), assignments (20%), mid-term exam (25%), final exam (30%), etc (in-class attitude & class participation) (15%)

Schedule:
Week 1 (Sep 7): Organizational meeting – What is Neuroscience? (assignment)
Lecturer: Dr. **Inah Lee**
Chapter(s): Chapter 1. Neuroscience: Past, Present, and Future
Reading assignment - Science: Conjectures & Refutations (Karl Popper) from Conjectures and Refutations: The Growth of Scientific Knowledge (New York: Harper Torchbooks, 1963), pp. 33-39, 52-55.

Week 2 (Sep 14): Neurons, the Building Blocks of the Brain.
Lecturer: Dr. **Inah Lee**
Chapter(s): Chapter 2. Neurons and Glia

Week 3 (Sep 21): Electrical Communications of Neurons
Lecturer: Dr. **Graham Collingridge** & Dr. **Kei Cho**
Chapter(s): Chapter 3. The Neuronal Membrane at Rest
Chapter 4. The Action Potential

Week 4 (Sep 28): Chemical Communications of Neurons

Lecturer: Dr. **Graham Collingridge** & Dr. **Kei Cho**
Chapter(s): Chapter 5. Synaptic Transmission
Chapter 6. Neurotransmitter Systems

Week 5 (Oct 5): From Molecules to Memory
Lecturer: Dr. **Bong-Kiun Kaang**
Chapter(s): Chapter 24. Molecular Mechanisms of Learning and Memory

Week 6 (Oct 12): Basic Neuroanatomy – What's the name of that area in the brain?
Lecturer: Dr. **Sang Jeong Kim**
Chapter(s): Chapter 7. The Structure of the Nervous System

Week 7 (Oct 19): Imaging the Brain in Action – Fundamentals of Neuroimaging
Lecturer: Dr. **Jae Sung Lee** & Dr. **Moo Chung**
Chapter(s): Chapter 7 (pp.174-178)

Week 8 (Oct 26): Midterm exam (assignment due)

Week 9 (Nov 2): How does the Brain Feel the Pain?
Lecturer: Dr. **Min Zhuo**
Chapter(s): Chapter 12. The Somatic Sensory System

Week 10 (Nov 9): How does the Brain See the World? – Vision
Lecturer: Dr. **Sang-Hun Lee**
Chapter(s): Chapter 9. The Eye
Chapter 10. The Central Visual System

Week 11 (Nov 16): Show me the move – Motor Systems
Lecturer: Dr. **Sang Jeong Kim**
Chapter(s): Chapter 13. Spinal Control of Movement
Chapter 14. Brain Control of Movement

Week 12 (Nov 23): Let it in and make it stick – Neural Bases of Learning and Memory
Lecturer: Dr. **Inah Lee**
Chapter(s): Chapter 24. Memory Systems

Week 13 (Nov 30): When things go wrong in the brain – Mental Illnesses and the Brain
Lecturer: Dr. **Jun Soo Kwon**
Chapter(s): Chapter 22. Mental Illnesses

Week 14 (Dec 7): Final exam

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