

LS324700 細胞神經科學

授課老師：焦傳金 (E-mail : ccchiao@life.nthu.edu.tw)

授課時間：週五第 a, b 節

授課地點：生科二館 217 教室

指定教科書：**Principles of Neural Science** (2012) Eric Kandel, James Schwartz, Thomas Jessell, Steven Siegelbaum, A.J. Hudspeth (Fifth Edition)

課程平台網址：<http://mooc.et.nthu.edu.tw/sharecourse/course/view/courseInfo/42>

授課週數：共 9 週課程，第五週期中考（線上），第九週期末考（線上+課堂）

授課方式：MOOC 課程，課前自行觀看授課影片，課堂以討論與問答方式進行。

評分方式：期中考 20%（線上考試 20%）、期末考 60%（線上考試 20%、課堂考試 40%）、出席表現 10%、線上討論 10%

週次	單元名稱	章節名稱	對應章節
Week 1	Fundamental properties of neurons	<ol style="list-style-type: none">1. Nerve cells and neural circuitry2. Cell biology of neurons3. Structure and function of glial cells4. Membrane potential of the neuron5. Equivalent circuit of the membrane potential6. Electrotonic potential of the neuron7. Diverse types of ion channels8. Molecular basis of ion channels9. Structure biology of ion channels	<p>Chapter 2</p> <p>Chapter 4</p> <p>Chapter 5</p> <p>Chapter 6</p>
Week 2	Transmission of neural signals	<ol style="list-style-type: none">1. Ionic basis of action potential2. Conductance change during action potential3. Gating mechanism of voltage-gated ion channels4. Diverse voltage-gated ion channels determine action potential patterns5. Propagation of action potential6. Neural signal transmission across electrical synapses7. Structure and function of electrical synapses8. Neural signal transmission across chemical synapses	<p>Chapter 7</p> <p>Chapter 8</p>

Week 3	Synaptic transmission: mechanisms	<ol style="list-style-type: none"> 1. The nerve-muscle synapse: end-plate potential 2. The time course of the end-plate potential 3. Current through single acetylcholine receptor-channels 4. Structure of acetylcholine receptor-channels 5. Synaptic transmission in the central nervous system 6. Excitatory synaptic transmission in central neurons 7. Inhibitory synaptic transmission in central neurons 8. Synaptic integration in the central nervous system 	Chapter 9 Chapter 10
Week 4	Synaptic transmission: neurotransmitters	<ol style="list-style-type: none"> 1. Transmitter release is triggered by depolarization and calcium influx 2. Synaptic vesicles and quantal release 3. The synaptic vesicle cycle 4. Modulation of transmitter release 5. Small-molecule transmitters: acetylcholine 6. Small-molecule transmitters: biogenic amines and amino acids 7. Peptide transmitters 8. Diseases of synaptic transmission 	Chapter 12 Chapter 13 Chapter 14
Week 5	Synaptic transmission: plasticity	<ol style="list-style-type: none"> 1. G protein-coupled receptors and second messengers 2. Modulation of synaptic transmission 3. Long-lasting effects of synaptic transmission 4. Short-term storage of implicit memory 5. Long-term storage of implicit memory 6. Working memory and long-term potentiation in the hippocampus 7. Hebbian learning rule and early/late phases of long-term potentiation 8. Spatial learning and long-term memory 	Chapter 11 Chapter 66 Chapter 67

Week 6	Development of neurons	<ol style="list-style-type: none"> 1. Patterning of the neural tube 2. Regionalization and functional subtypes of neurons 3. Proliferation, differentiation, and neuronal cell fate 4. Migration, differentiation, and the neurotransmitter phenotype of neurons 5. Survival and apoptosis of neurons 6. Establishment of neuronal polarity 7. The growth cone of axon 8. Molecular cues of axon guidance 	<p>Chapter 52</p> <p>Chapter 53</p> <p>Chapter 54</p>
Week 7	Development of synapses	<ol style="list-style-type: none"> 1. Growth of retinal ganglion axons 2. Midline crossing of spinal neuron axons 3. Recognition of synaptic targets 4. Synaptic differentiation in neuromuscular junction 5. Synaptic differentiation in central neurons and synapse elimination in neuromuscular junctions 6. Experience-dependent development of binocular circuits 7. Reorganization of visual circuits in a critical period 8. Activity-dependent refinement of auditory maps 	<p>Chapter 54</p> <p>Chapter 55</p> <p>Chapter 56</p>
Week 8	Degeneration and regeneration of neurons	<ol style="list-style-type: none"> 1. Axon degeneration and regeneration 2. Regeneration of injured central neurons 3. Neurogenesis in the central nervous system 4. Regenerative therapies 5. Trinucleotide repeat diseases 6. Parkinson disease 7. The aging brain 8. Alzheimer disease 	<p>Chapter 57</p> <p>Chapter 59</p> <p>Chapter 44</p>