MBB-1405: Multicellular Organization of Life	
PART A: Development and aging	
Δευτέρα, 13 Δεκέμβριος 2021	
	Introduction to development (D. Alexandraki) 2h
10:00-12:00	*How different cells become different (Are there common principles in development?)*
	Cell autonomous versus non-autonomous mechanisms
	Asymmetric cell division, Organizers and long range patterning by morphogens, Pattern formation
	Concepts of cell fate (fate maps), cell specification, commitment and differentiation, de-differention, regeneration
	Genetic toolbox, Evo-Devo, Current approaches to old problems
12:30-14:30	**Long range patterning: regulatory cascade in early Drosophila embryo (D. Alexandraki) 2h**
	Introduction to early drosophila development (oogenesis, blastoderm)
	Experimental embryology, genetic and molecular approaches
	Progressive subdivision of the embryo through a regulatory cascade
	Maternal gradients, gap domains, pair rule and segmental stripes
	Regulatory interactions at each level
	cis–trans interactions (quantitative-qualitative, time and space specific)
Τρίτη, 14 Δεκέμβριος 2021	
10:00-12:00	**Principles of developmental fate decisions –Morphogens C. Delidakis 2h**
	Determinants vs morphogens
	Organization of animal tissues into compartments
	Transcriptional response to morphogen signaling
	Morphogen dispersal modes: diffusion, transcytosis or direct delivery?
12:30-14:30	**Plant development K. Kalantidis 2h**
	Shoot apical meristem development
	Leaf development, specification of leaf polarity
15:30 – 16:30	Trajectory analysis of cell fates Mat Lavigne 1h

Τετάρτη, 15 Δεκέμβριος 2021	
10:00-12:00	**How morphogens regulate tissue growth C. Delidakis 2h**
	Distinction between growth and proliferation
	Morphogen crosstalk with insulin receptor and Hippo pathways
12:30-14:30	**Plant versus animal development K. Kalantidis 2h**
	Introduction to plant development
	Differences between plant and animal development
Πέμπτη, 16 Δεκέμβριος 2021	
10:00-12:00	**Localized determinants and asymmetric stem cell divisions C. Delidakis 2h**
	Introduction to Drosophila neurogenesis
	The molecular machinery that ensures asymmetric segregation of fate determinants in Drosophila neural stem cells
	Function of determinants
	Comparison with mammalian neural stem cells
	Aberrant determinant segregation and tumorigenesis
12:30-14:30	**Physical basis of development (Tasos Pavlopoulos) 2h**
	- Beyond a gene-centric view of development
	- Morphogenetic cell and tissue dynamics
	- Mechanical properties and physical forces in developmental processes
Παρασκευή, 17 Δεκέμβριος 2021	
10:00-12:00	Reactive oxygen species in health and disease - Daphne Bazopoulou
	Molecular Basis of Redox Signaling
	Measuring ROS: Methods and Applications
	Redox Homeostasis during Aging and Stress

	Antioxidants and Pro-oxidants: Benefits and Misconceptions
12:30-14:30	**Molecular motors and mechanical sensing - emphasis on plants (Panagiotis Moschou) 2 h**
15:00-17:00	**Evolutionary Developmental Biology (Tasos Pavlopoulos) 2h**
	- History, scope and basic concepts of EvoDevo
	- Phylogeny and developmental genetic toolkit of animals
	- Evolution of developmental programs and morphological diversity
Δευτέρα, 20 Δεκέμβριος 2021	
9:30-11:30	**Neural tube patterning in the vertebrate CNS (M. Denaxa, Fleming) 2h**
	AP and DV patterning of the neural tube (Hox genes, retinoic acid, shh, BMPs)
	Generation of secondary signaling centers in brain (forebrain, ZLI, isthmic organizer)
	Spinal cord: dorsal and motor neuron progenitor domains and diversity
	Neuronal migration, generation of layers
	Radial vs tangential migration, signals
12:00-14:00	**Papers/discussion**: Plant development **(K. Kalantidis) 2h**
PART B: NEUROBIOLOGY	
Δευτέρα, 10 Ιανουάριος 2022	
9:30-11:30	**Axon pathfinding and migration (D. Karagogeos) 2h**
	Neuronal extension - the growth cone
	Axon guidance introduction: concepts and families of molecules
	Midline crossing (Drosophila, vertebrates).
	Morphogens as axon guidance signals
	Intracellular events
12:00-14:00	**Neuronal cell fate in development and aging: the role of Neurotrophins (G. Charalampopoulos) 2h**
	Neurotrophic theory in nervous system development

	Neurotrophins and their receptors as regulators of neuronal survival and cell death
	Neurotrophins role in neuro/glia-regeneration and adult neurogenesis
	The pharmacology of neurotrophins
Τρίτη, 11 Ιανουάριος 2022	
10:00-12:00	**Axonal growth in health and disease/ adult neurogenesis M. Vidaki 3h**
13:00-15:00	**Papers/discussion: Morphogens and localised determinants C. Delidakis 2h**
Τετάρτη, 12 Ιανουάριος 2022	
9:30-11:30	**Genetics of cognition and behaviour I M. Monastirioti 2h**
	How an organism acquires specific behavioral patterns as a response to environmental changes
	Introduction to memory and memory types
	Genetics of associative learning (Drosophila)
12:30-14:30	Neuronal plasticity models and their function - Nassi Papoutsi
Πέμπτη, 13 Ιανουάριος 2022	
10:00-12:00	**Genetics of cognition and behaviour II M. Monastirioti 2h**
	Cellular models for short and long term memory (Aplysia, Mouse, molecules and mechanisms)
	Mechanisms of synapse marking
	Mechanisms of synapse changes during long term memory
13:00-15:00	**Introduction to computational neuroscience - simplified neuron models (Y. Poirazi) 2h**
Παρασκευή, 14 Ιανουάριος 2022	
10:00-12:00	**Detailed biophysical neuron models (Y. Poirazi) 2h**
13:00-15:00	**Functional maps M.Froudarakis**

Δευτέρα, 17 Ιανουάριος 2022	
10:00-12:00	**Papers/ discussion:** Axon growth (**M. Vidaki)**
Τρίτη, 18 Ιανουάριος 2022	
10:00-12:00	**Papers/discussion**: **Models complementing experiments (Y. Poirazi) 1h**
13:00-15:00	**Papers/discussion**: cognition and behavior **(M. Monastirioti) 2h**
PART C: INFECTIONS AND IMMUNITY	
Τετάρτη, 19 Ιανουάριος 2022	
10:00-12:00	**Mechanisms of Innate/Adaptive immunity (G. Bertsias) 2h**
	Properties and overview of Immune responses
	Innate Immunity
	Cells and tissues of the Adaptive Immune System
13:00-15:00	***Immune regulation, autoimmunity and immunotherapy in humans (G. Bertsias) 2h***
	Homeostatic mechanisms in the immune response
	Autoimmunity: general concepts
	General approaches to immunotherapy - Biologic therapy
Πέμπτη, 20 Ιανουάριος 2022	
10:00-12:00	**Signal transduction pathways in innate and adaptive immune responses (C. Tsatsanis) 2h**
	Cytokines regulating innate and adaptive immune responses
	Signaling pathways regulating innate immunity
	non-coding RNAs in the regulation of immune responses
13:00-15:00	**Hematopoiesis: a human perspective (C. Pontikoglou) 2h**

	Overview of primitive and adult hematopoiesis
	Transcriptional regulation of hematopoietic stem cells
	Stem cell niches witihin the Bone Marrow
Παρασκευή, 21 Ιανουάριος 2022	
10:00-12:00	**Molecular mechanisms of phagosome biogenesis in Health and Disease**
	(G. Chamilos) 2h
	Signaling pathways regulating phagosome maturation
	Pathogenetic mechanisms of phagosome maturation arrest induced by airborne fungi
	Congenital and acquired mechanisms of immunodeficiency at the phagosome level
13:00-16:00	**Protozoan life cycles, host-pathogen interactions (I. Siden-Kiamos) 3h**
	Introduction to protozoan parasites
	Plasmodium: Life cycle, cell invasion/motility, antigenic variation, modification of host cells
	Giardia, Trypanosoma brucei: Life cycles, cell biology, antigenic variation
Δευτέρα, 24 Ιανουάριος 2022	
10:00-12:00	**Innate Immunity in Plants: The role of NLR receptors in plant-microbe interactions (P. Sarris)**
	Why is it important to study plant immunity?
	Innate immunity in Plants, different types of immune receptors; a comparison to mammalian innate immunity.
	Signaling pathways to defense activation.
	Plant-pathogen virulence strategies
13:00-15:00	**Papers/discussion: mechanisms of adaptive immunity (G. Bertsias) 2h**
Τρίτη, 25 Ιανουάριος 2022	
10:00-12:00	**Papers/ discussion Infection & Immunity 1 (Tsatsanis) -** *Regulation of innate immune responses* **(2h)**
14:00-16:00	**Papers/ discussion Infection & Immunity 2 (Chamilos) (2h)**
	Immunometabolism and host defense

Τετάρτη, 26 Ιανουάριος 2022	
10:00-11:00	**Round table discussion – C. Delidakis et al.**
Πέμπτη, 27 Ιανουάριος 2022	**(Iiliopoulos lecture BIO 1411)**
Παρασκευή, 28 Ιανουάριος 2022	**(Iiliopoulos lecture BIO 1411)**
Παρασκευή, 4 Φεβρουάριος 2022	
10:00-13:00	**Final exam**
	Students will be continuously evaluated by their performance in discussion sessions and overall class participation. This, together with the final exam, will count towards their final grade (30% oral – 70% written).