Testi del Syllabus

Resp. Did.	**TONGIORGI ENRICO**	**Matricola: 005813**

Docenti	**BAJ GABRIELE, 3 CFU** **TONGIORGI ENRICO, 6 CFU**
Anno offerta:	**2023/2024**
Insegnamento:	**974SV - CELLULAR AND MOLECULAR NEUROBIOLOGY**
Corso di studio:	**SM75 - NEUROSCIENCE**
Anno regolamento:	**2023**
CFU:	**9**
Settore:	**BIO/06**
Tipo Attività:	**B - Caratterizzante**
Anno corso:	**1**
Periodo:	**Primo Semestre**
Sede:	**TRIESTE**

Testi in italiano

Lingua insegnamento	English
Contenuti (Dipl.Sup.)	The purpose of the course is to give an overview of molecular mechanisms that regulate the principal cellular functions of neurons and glial cells. Topics of the course are: PART A (Tongiorgi) The cellular basis of the nervous system: I Cellular diversity of the neurons; II Glial cells; III Glial cells and the formation of the myelin, IV The synapse. Inside the neuron: I Organelles, Golgi apparatus & secretion; II mechanisms of presynaptic secretion; III The postsynaptic density; IV cytoskeleton & molecular motors (axonal transport); V Dendritic spines. Functional cellular neurobiology: I Dendritic mRNA targeting and local protein synthesis; II Neurotrophins and their signalling; III Hippocampal anatomy and LTP. PART B (Baj) This part of the course is focused on the principal techniques used to investigate biological questions related to neuronal growth and differentiation. Practical sessions will be based on the methods to prepare, grow, transfect and measure the morphology of neurons in culture. A brief introduction on the microscopy practices more used in neuroscience research is included.
Testi di riferimento	Articles and handsouts provided by the teachers. Squire et al. “Fundamental neuroscience” “Dendrites” by K. Harris & J.Fiala
Obiettivi formativi	The aims of the course can be summarized as follows: 1) knowledge and understanding: The course is designed to familiarize the students with the concept of the relationship between the structure of the different subcellular structures of a neuron and their role in the

	physiological functions with emphasys on the molecular mechanisms. 2) Applying knowledge and understanding: The practical and theoretical lectures also aim at introducing the students to the scientific methodology typical of cellular neurobiology. The practical module (Techniques) of the course aims at teaching students how to design a cell-based assay to address specific biological problems in neuroscience. The module Applied Neuroscience is a professionalizing short course aiming at introducing students to the basic concepts of technology transfer by exposing them to the industrial approaches to develop treatments and diagnostics for brain disorders 3) Making judgements: The students will have to acquire independence in the evaluation of the best scientific methodology to perform researches in cellular neurobiology. This will be achieved also through non-conventional class exercise. 4) Communication skills and learning skills: during the course, student will make group and individual presentations of their work using different forms of communication. 5) Learning abilities: students will be given the tools to explore the literature and to learn from scientific publications.
Prerequisiti	Basic courses (from a previous degree) in cell biology, histology and physiology
Metodi didattici	Frontal lectures with power point slide projections and short movies (prof. Tongiorgi). Conventional as well as "non-conventional" group and individual exercises to be done in the class are included in the course. The course also has a module with practical lab/microscopy exercise and preparatory lessons (Dr.Baj)
Altre informazioni	Any changes, necessary to ensure the application of the safety protocols related to the COVID19 emergency, will be communicated on the Course website.
Modalità di verifica dell'apprendimento	The written exam (paper or Moodle) on the entire A+B program will receive up to a maximum score of 26 and will be followed by an oral exam worth up to a maximum of 6 points. A score above 30.5 is considered as 30 cum laude. The written exams consists of T/F or multiple choice questions. Wrong answers receive a score of -0.2 points. Any changes to these indications, which should become necessary, will be communicated on the Degree Course website and on the Moodle page of the course.
Programma esteso	CELLULAR AND MOLECULAR NEUROBIOLOGY: PART A (Tongiorgi) LESSONS 1-4. The cellular organization of the nervous system: 1) Neurons & The neural cellular theory, 2) Glial cells and the BBB; 3) Glial cells and the Myelin; 4) Astrocytes and the tripartite synapse. LESSONS 5-6. The synaptic spacialization: 5) Dendritic Spines; 6) History and general features of the synapse. LESSONS 7-12. Inside the neuron: 7) organelles and secretion; 8) molecular mechanisms of protein secretion; 9) structural organization of (excitatory/inhibitory) presynaptic terminals; 10) the postsynaptic density; 11) molecular mechanisms of postsynaptic density maintenance & plasticity; 12) Cytoskeleton. LESSONS 13-19 Molecular cell biology of the neuron: 13) axonal transport; 14) Dynein-kinesins molecular motors; 15) protein synthesis; 16) cellular mRNA localization, translation and degradation; 17) P-bodies, stress granules and the mRNA cycle; 18) Protein degradation and the proteasome; 19) Growth factors/Neurotrophins and their signalling. LESSONS 20-21 Plasticty: 20) The cellular and anatomical structure of the hippocampus; 21)Molecular basis of plasticity at excitatory synapses. PART B (Baj) Lesson 1) Course presentation and introduction to scientific methods and specific models applied to research in neurobiology. Laboratory 1) Cell culture in vitro: substrate preparation and cells seeding. Topic on working

	in a sterile environment. Laboratory 2) Cell culture in vitro: genetic modification using transfection techniques and cells fixation for additional experiments. Lesson 2) Introduction to microscopy techniques used in neuroscience research. Laboratory 3) Cell culture in vitro: Cells fixation and processing for morphological analysis. Laboratory 4) Histological processing of brain slices in preparation to microscopy sessions. Lesson 3) Specific techniques for specific biological questions. Laboratory 5) Microscopy revision of histological and cytological preparations. Lesson 4) Morphological measurements. Qualitative and quantitative assays. Revision of the concept presented and open discussion.
Obiettivi Agenda 2030 per lo sviluppo sostenibile	This course explores topics closely related to one or more goals of the United Nations 2030 Agenda for Sustainable Development (SDGs). Specifically, N.3 Health and wellbeing N.4 Education of quality

Obiettivi per lo sviluppo sostenibile

Codice	Descrizione
3	Salute e benessere
4	Istruzione di qualità

Testi in inglese

	English
	The purpose of the course is to give an overview of molecular mechanisms that regulate the principal cellular functions of neurons and glial cells. Topics of the course are: PART A (Tongiorgi) The cellular basis of the nervous system: I Cellular diversity of the neurons; II Glial cells; III Glial cells and the formation of the myelin, IV The synapse. Inside the neuron: I Organelles, Golgi apparatus & secretion; II mechanisms of presynaptic secretion; III The postsynaptic density; IV cytoskeleton & molecular motors (axonal transport); V Dendritic spines. Functional cellular neurobiology: I Dendritic mRNA targeting and local protein synthesis; II Neurotrophins and their signalling; III Hippocampal anatomy and LTP. PART B (Baj) This part of the course is focused on the principal techniques used to investigate biological questions related to neuronal growth and differentiation. Practical sessions will be based on the methods to prepare, grow, transfect and measure the morphology of neurons in culture. A brief introduction on the microscopy practices more used in neuroscience research is included.
	Articles and handsouts provided by the teachers. Squire et al. “Fundamental neuroscience” “Dendrites” by K. Harris & J.Fiala
	The aims of the course can be summarized as follows: 1) knowledge and understanding: The course is designed to familiarize the students with the concept of the relationship between the structure of the different subcellular structures of a neuron and their role in the physiological functions with emphasys on the molecular mechanisms. 2) Applying knowledge and understanding: The practical and theoretical lectures also aim at introducing the students to the scientific methodology typical of cellular neurobiology. The practical module (Techniques) of the course aims at teaching students how to design a cell-based assay to address specific biological problems in neuroscience. The module Applied Neuroscience is a professionalizing short course

	aiming at introducing students to the basic concepts of technology transfer by exposing them to the industrial approaches to develop treatments and diagnostics for brain disorders 3) Making judgements: The students will have to acquire independence in the evaluation of the best scientific methodology to perform researches in cellular neurobiology. This will be achieved also through non-conventional class exercise. 4) Communication skills and learning skills: during the course, student will make group and individual presentations of their work using different forms of communication. 5) Learning abilities: students will be given the tools to explore the literature and to learn from scientific publications.
	Basic courses (from a previous degree) in cell biology, histology and physiology
	Frontal lectures with power point slide projections and short movies (prof. Tongiorgi). Conventional as well as "non-conventional" group and individual exercises to be done in the class are included in the course. The course also has a module with practical lab/microscopy exercise and preparatory lessons (Dr.Baj)
	Any changes, necessary to ensure the application of the safety protocols related to the COVID19 emergency, will be communicated on the Course website.
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	Morphological measurements. Qualitative and quantitative assays. Revision of the concept presented and open discussion.

	This course explores topics closely related to one or more goals of the United Nations 2030 Agenda for Sustainable Development (SDGs). Specifically, N.3 Health and wellbeing N.4 Education of quality

Obiettivi per lo sviluppo sostenibile

Codice	Descrizione
3	Good health and well-being
4	Quality education