Testi del Syllabus

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

Docenti	**BAJ GABRIELE, 3 CFU** **TONGIORGI ENRICO, 9 CFU**
Anno offerta:	**2022/2023**
Insegnamento:	**974SV - CELLULAR AND MOLECULAR NEUROBIOLOGY**
Corso di studio:	**SM54 - NEUROSCIENZE**
Anno regolamento:	**2022**
CFU:	**12**
Settore:	**BIO/06**
Tipo Attività:	**B - Caratterizzante**
Anno corso:	**1**
Periodo:	**Primo Semestre**
Sede:	**TRIESTE**

Testi in italiano

Lingua insegnamento	INGLESE
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. PART C Applied Neurosciences: a short course with the help of specialists from pharmaceutical, biotechnological and nutraceutical industries on the making of new treatments in the field of brain diseases and on technology transfer from the idea to a product.
Testi di riferimento	Articles and handsouts provided by the teachers. Squire et al. “Fundamental neuroscience” “Dendrites” by K. Harris & J.Fiala
Obiettivi formativi	The aim 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.

Prerequisiti

Basic courses (from a previous degree) in cell biology, histology and physiology

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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)

Modalità di verifica dell'apprendimento

Written exam (Moodle) on the whole program (+ facultative Oral exam) for Cellular and Molecular Neurobiology and Techniques modules. Written exam are T/F type of responses.
Correct answers +0.4, wrong answers - 0.2 points.
Exercises in the classroom and a group-essay for Applied Neurosciences. This module can give an extra point of +0.5 or +1 on the final mark which is given by the weighted mean of the other two modules.
Any changes to these indications, which may become necessary to ensure the application of safety protocols related to the COVID19 emergency, will be communicated on the Department’s and Degree Course websites and Lecture course Moodle page.

Programma esteso

CELLULAR AND MOLECULAR NEUROBIOLOGY: 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. APPLIED NEUROSCIENCES: The course is organized every year during the second week of January and lectures are hold by ~12-15 highly qualified experts from industries operating mainly in Italy and Europe. Topics of the lectures are updated every year and generally are subdivided in 5 days of seminars dealing with: DAY 1: Target identification & in vitro drug testing at pharmaceutical companies. DAY 2) Drug discovery for CNS at a Contract Research Organization (CRO). DAY 3) Developing innovative therapeutic approaches at biotech companies. DAY4) Regulatory affairs and technology transfer. DAY 5) What means creating your own company? – On site visits at Companies or at Area di Ricerca are possible.
Obiettivi Agenda 2030 per lo sviluppo sostenibile	N.3 Salute e benessere N.4 Istruzione di qualità

Obiettivi per lo sviluppo sostenibile

Codice	Descrizione
3	Salute e benessere
4	Istruzione di qualità

Testi in inglese

	English
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	N.3 Good health and wellbeing N.4 Quality Education

Obiettivi per lo sviluppo sostenibile

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