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# Testi del Syllabus

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Resp. Did. **LUCAFÒ MARIANNA** **Matricola: 015417**

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Docenti **LUCAFÒ MARIANNA, 6 CFU**  
**MARCON GABRIELLA, 3 CFU**

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Anno offerta: **2023/2024**

Insegnamento: **975SV - NEUROANATOMY AND NEUROPHARMACOLOGY**

Corso di studio: **SM75 - NEUROSCIENCE**

Anno regolamento: **2023**

CFU: **9**

Anno corso: **1**

Periodo: **Primo Semestre**

Sede: **TRIESTE**

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## Testi in italiano

**Lingua insegnamento** English

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**Contenuti (Dipl.Sup.)** The course is composed of two parts:  
PART 1 (Prof. Marcon Gabriella):  
NEUROANATOMY  
-Introduction to the Neuroanatomy  
-Overview to the main histological structures of the Central Nervous System and Peripheral Nervous System.  
-Overview to development of CNS, brain plasticity and brain aging.  
-General features and external morphology of the CNS  
-Meninges, cisterns, ventricles  
-Internal morphology:  
1. Spinal Cord: gray horns and ascending and descending pathways  
2. Autonomic Nervous System  
3. Brainstem  
4. Cerebellum  
5. Reticular Formation  
6. Thalamus, Hypothalamus and Epithalamus  
7. Basal Ganglia  
8. Limbic System  
9. Telencephalon  
-Blood supply of the brain and spinal cord  
  
PART 2 (Dr Marianna Lucafò): NEUROPHARMACOLOGY  
Introduction to pharmacology  
Drug development  
Pharmacokinetics  
Pharmacodynamics  
Pharmacogenomics and personalized medicine  
Autonomic pharmacology  
Opioid agonist & antagonist  
Anti-Epileptic Drugs

Sedative-hypnotic drugs  
Drugs of neurodegenerative diseases  
Antipsychotic agents  
Antidepressant agents  
Psychoactive drugs  
Drugs of abuse  
Pharmacogenomics and drugs of the central nervous system

## Testi di riferimento

### PART1: NEUROANATOMY

1) Lecture notes (PDF)  
2) Fitzgerald's Clinical Neuroanatomy and Neuroscience, Authors: Estomih Mtui, Gregory Gruener, Peter Dockery; 8th Edition - August 4, 2020

### PART 2: NEUROPHARMACOLOGY

Rang, Ritter, Flower, Henderson "Rang & Dale's Pharmacology" Tenth edition

## Obiettivi formativi

### PART 1 - NEUROANATOMY

- Knowledge of the microscopic and macroscopic structures and functions of the Central Nervous System.
- Understanding morphology of the different neuroanatomical areas in relation to their function: (A) Central Nervous System (from Spinal Cord to Multimodal Association Cortex and Ascending and Descending Tracts); (B) Peripheral Nervous System and Autonomic Nervous System (course and function of Spinal Nerves and Cranial Nerves)-
- Being able to know the anatomical areas and their functions in normal and pathological conditions in relation to the main neurological disorders
- Ability to use the correct neuroanatomical terminology; improving knowledge autonomously by reading scientific papers and textbooks and consult the scientific websites relevant to the topic.

The overall aim of the part 1 is to provide students with a basic understanding of the structural (and functional) organization of the human central nervous system (Knowledge and understanding), in sufficient depth to form the basis for further clinical or research studies (Applying knowledge and understanding; Making judgements; Communication and Learning skills).

### PART 2: NEUROPHARMACOLOGY

To provide robust basis of Neuropharmacology, discussing the principles at the basis of the pharmacokinetic, pharmacodynamics and pharmacogenomics properties of drugs, particularly of those acting at the peripheral and central nervous system

1) Knowledge and understanding: at the end of the course, the students should have acquired the basic notions for the comprehension of the pharmacokinetic and pharmacodynamics properties of drugs and of their mechanism of action, with particular reference to drugs acting at the central nervous system.

2) Applying knowledge and understanding: at the end of the course, the students should be able to use the knowledge acquired (see point 1) for a proper use of drugs in experimental set-ups (in vivo as well as in vitro) as tools to validate hypothesis regarding the involvement of endogenous neurotransmitters in controlling physio-pathological conditions.

3) Making judgements: at the end of the course, the students should be able to apply their pharmacokinetic and pharmacodynamics knowledges for a critical consideration of experimental results aimed at investigating the involvement of signaling molecules in physiological and pathological processes.

4) Communication skills: at the end of the course, the students should be able to discuss clearly and with appropriate scientific terms pharmacological concepts.

5) Learning skills: at the end of the course, the students should have a well-build background that should enable them to continue to enlarge autonomously and critically their knowledges about the pharmacokinetic

and pharmacodynamics properties of drugs.

## Prerequisiti

No prerequisites

## Metodi didattici

PART1 - NEUROANATOMY: The program is constituted by frontal lessons (slides, neuroanatomy and techniques of brain cutting video and examples of clinic cases).

PART 2 - NEUROPHARMACOLOGY: Computer-aided frontal lectures (slides with images and short texts reassuming the essential aspects of the lessons); moreover one or more seminar activities will be planned to explore specific topics in depth. Students participation will be stimulated by group exercises.

## Altre informazioni

Students are provided by the slides used during the frontal lessons thought Moodle. For further information, students are invited to contact Dr Marianna Lucafò by mail (mlucafo@units.it) using their institutional E-mail address.

Any necessary change in the course modalities due to COVID19 emergency will be published at the Department, Master Programme and Course websites.

## Modalità di verifica dell'apprendimento

PART 1- NEUROANATOMY: a) During the course: written test with multiple choice questions (30 questions with one correct answer and several wrong answers with a point for each correct answer and zero for wrong answers or no answers); b) At the end of the course: oral examination, in which the student must be able to use the correct neuroanatomical terminology and to know the main anatomical areas and their main functions, the sensory and motor pathways, the autonomic nervous system and blood supply of the brain. The final grade is explained below.

### PART 2 - NEUROPHARMACOLOGY

The learning assessment includes an oral exam designed to assess the level of knowledge of the topics covered in the program, the level of mastery and precision of the specialized language, and the ability to develop an argument by applying the knowledge acquired in teaching course and integrating it with the other disciplines already covered in the study course. The exam lasts between 20 and 40 minutes and covers all topics in the program. The result of the exam will be evaluated with a score of thirty points based on the following criteria:

-Excellent (30 - 30 cum laude): excellent knowledge of the topics, excellent language skills, excellent analytical skills; the student is able to brilliantly apply theoretical knowledge to concrete cases.

-Very good (27 -29): good knowledge of the topics, remarkable language skills, good analytical skills; the student is able to correctly apply theoretical knowledge to concrete cases.

-Good (24-26): good knowledge of the main topics, good language skills; the student shows adequate ability to apply theoretical knowledge to concrete cases.

- Satisfactory (21-23): The student does not fully master the main topics of teaching, but has the basic knowledge; however, he/she demonstrates satisfactory language skills and an adequate ability to apply theoretical knowledge to concrete cases.

-Sufficient (18-20): minimal knowledge of the main topics of teaching and technical language, limited ability to adequately apply theoretical knowledge to concrete cases.

- Insufficient (< 18): The student does not have acceptable knowledge of the content of the various topics of the teaching course.

The final mark/30 is the weighted mean of Part 1 (Neuroanatomy) and Parts 2 (Neuropharmacology)

Any changes to the indications described here, which may become necessary to ensure the application of safety protocols related to the COVID-19 emergency, will be communicated on the Department's and Degree Course websites and Lecture course Moodle page.

## Programma esteso

### NEUROANATOMY

Main features of structure of Central and Peripheral Nervous System  
Structure of the Neuron and Glia and Organization of the Nervous Tissue.

#### DEVELOPMENT, AGING AND PLASTICITY:

The Role of Environment in Development of the Nervous System;  
Age-Related Changes in the Normal Brain and Their Consequences  
Age-Related Changes in Neurodegenerative Disorders

#### THE AUTONOMIC NERVOUS SYSTEM:

Sympathetic System  
Parasympathetic System

#### PARTS OF THE CENTRAL NERVOUS SYSTEM:

the Spinal Cord; The Brain Stem; the Cerebrum; the Cerebellum.  
The Meninges; the Cerebral Ventricles and the Cerebrospinal Fluid.  
The Blood Supply: the Blood-Brain Barrier; Arterial System; Venous System

#### SENSORY SYSTEMS:

Central Somatosensory Pathways: spinothalamic tract and dorsal column-medial lemniscus pathway, The Somatosensory Cortical Regions

The Visual System

The Auditory System

The Sense of Equilibrium

The Olfactory System and the Sense of Taste

#### MOTOR SYSTEMS:

The Motor Cortical Areas and Descending Pathways, The Pyramidal Tract (Corticospinal tract), Indirect Corticospinal Pathways

The Basal Ganglia:

Structure and Connections of Basal Ganglia-

The Cerebellum-

#### THE BRAIN STEM AND CRANIAL NERVES:

The Reticular Formation

The Cranial Nerves

Hypothalamus

The Thalamus

#### LIMBIC STRUCTURES

#### THE CEREBRAL CORTEX:

Intrinsic Organization and Connections, Functions of the Neocortex, Association Areas, The Division of tasks between the Hemispheres

### NEUROPHARMACOLOGY

General pharmacology: drug sources, chemical vs biological drug

Drug development: preclinical and clinical testing

PHARMACOKINETICS: ADME (drug absorption, distribution, metabolism and excretion); distribution volume, renal clearance, elimination half-time. Bioavailability and Bioequivalence. Pharmacokinetic models: linear and non-linear.

PHARMACODYNAMICS: protein targets for drug action and drug-receptor interaction. Agonists-Antagonists and Allosteric modulation. Quantification of drug action: dose-effect relationship and dose-response curves. Affinity and intrinsic efficacy.

PHARMACOGENOMICS: genetic variation in drug responsiveness and common laboratory methods in pharmacogenomics studies; non-genetic factors and inter-individual variation of drug response;

THE AUTONOMIC NERVOUS SYSTEM: anatomical and functional aspects.

- Cholinergic and Adrenergic transmission:

receptor classification and pharmacological features.

THE ENDOGENOUS OPIOIDS' SYSTEM: endogenous opioids synthesis and degradation. Opioid receptors classification and pharmacological features.

ANALGESIC DRUGS: Opioid drugs and paracetamol

ANTI-EPILEPTIC DRUGS: etiopathogenesis of epilepsy. Antiepileptic drugs: classification and mechanisms of action

ANXIOLYTIC AND HYPNOTIC DRUGS: the nature of anxiety and its treatment. Anxiolytic drugs: classification and mechanisms of action; Drugs used to treat insomnia.

DRUG THERAPY OF NEURODEGENERATIVE DISEASES: pathogenesis of Alzheimer's disease and therapeutic approaches, pathogenesis of Parkinson's disease and drug treatment; therapeutic options for Huntington's Disease, Amyotrophic Lateral Sclerosis, and Multiple

Sclerosis.

ANTIDEPRESSANT DRUGS: etiopathogenesis of depression. The monoaminergic, neuroendocrine and neurotrophic theories. Antidepressant drugs classifications and mechanisms of action.

ANTIPSYCHOTIC DRUGS: etiopathogenesis of psychosis. The dopaminergic and neurodevelopmental theories. Typical and atypical antipsychotic drugs and mechanisms of action.

PSYCHOACTIVE DRUGS: psychomotor stimulants and cognition-enhancing drugs

DRUGS OF ABUSE

PHARMACOGENOMICS AND DRUGS OF THE CENTRAL NERVOUS SYSTEM: clinical pharmacogenetic implementation guidelines for drugs acting on the central nervous system.

### Obiettivi Agenda 2030 per lo sviluppo sostenibile

This course addresses issues closely related to one or more of the United Nations 2030 Agenda for Sustainable Development goals.

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
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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