### Testi del Syllabus

**Testi in italiano**

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<th>Lingua insegnamento</th>
<th>English</th>
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**Contenuti (Dipl.Sup.)**

The course is composed of two parts:

**PART 1 (Prof. G. Marcon):**

- 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: VERTEBRATE BRAIN EVOLUTION**

1. Comparative neuroanatomy
2. Basis of comparative brain morphogenesis
3. Comparative brain histogenesis
4. Evolutionary developmental approach: a genetic perspective
5. Laboratory techniques for evolutionary research
6. 15 min short talk presentation practice

**Testi di riferimento**

**PART 1: NEUROANATOMY**

1) Lecture notes (PDF)
2) Fitzgerald's Clinical Neuroanatomy and Neuroscience, Authors: Estomih Mtui, Gregory Gruener, Peter Dockery; 8th Edition - August 4,
### 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 - VERTEBRATE BRAIN EVOLUTION**
- Knowledge and understanding: The course aims at providing general knowledge in comparative neuroanatomy and brain morphogenesis, and a more detailed knowledge in histogenesis regulation in different vertebrates, with special attention to mammals.
- Applying knowledge and understanding: Students will understand more about the evolutionary developmental (evo-devo) research approach (from both a theoretical and a technical perspectives) and they will be able to search for and read scientific papers related to the field.
- Communication skills: A 15 minute- scientific presentation will be practiced in the end of the course, so the students will also improve their oral communication skills, to be exploited at conferences and scientific meetings in their near future careers.

### Prerequisiti

No prerequisites for both PART 1 and 2.

### Metodi didattici

**PART 1 - NEUROANATOMY:** The program is constituted by frontal lessons (slides, neuroanatomy and techniques of brain cutting video and examples of clinic cases).

**PART 2 – VERTEBRATE BRAIN EVOLUTION**
Frontal lectures and workgroupS.

### Altre informazioni

**PART 1 – NEUROANATOMY**
Students are provided by the slides used during the frontal lessons thought TEAMS.
For further information, students are invited to contact prof. Gabriella Marcon by email (gmarcon@units.it) using their institutional E-mail address.

**PART 2 - VERTEBRATE BRAIN EVOLUTION**
Scientific papers and weblinks will be provided via email during the course. For further information, students are invited to contact prof. Carmen Falcone by email (cfalcone@sissa.it) using their institutional E-mail address.

### Modalità di verifica dell'apprendimento

PART of HUMAN 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 overall rating is given by the evaluation of the two tests (multiple choice test + oral test) 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.

PART 2 – VERTEBRATE BRAIN EVOLUTION

Oral test, the criteria for evaluation will be as above.

Programma esteso

PART 1- NEUROANATOMY
Main features of structure of Central and Peripheral Nervous System
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
SENSORY SYSTEMS:
- Central Somatosensory Pathways: spinothalamic tract and dorsal column-medial lemniscus pathway, The Somatosensory Cortical Regions
MOTOR SYSTEMS:
- The Motor Cortical Areas and Descending Pathways, The Pyramidal Tract (Corticospinal tract
- The Basal Ganglia:
- Structure and Connections of Basal Ganglia-
- The Cerebellum-
THE BRAIN STEM AND CRANIAL NERVES:
- The Cranial Nerves
- Hypothalamus and Thalamus
THE CEREBRAL CORTEX:
- Intrinsic Organization and Connections, Functions of the Neocortex, Association Areas, The Division of tasks between the Hemispheres

PART 2 – VERTEBRATE BRAIN EVOLUTION

The course will give a general introduction to the anatomy of the different parts of the central nervous system in vertebrates. It will provide a basis on comparative brain morphogenesis, with special attention to the evolution of genetic regulations of such processes.

A big portion of the course will focus on comparative brain histogenesis, e.g. cell differentiation in different organisms, with particular attention to mammalian nervous cell diversity. Throughout the course, the evolutionary developmental approach will be explained and a special focus will be on the cerebral cortex of mammals (why is it so special?). In the following part of the course, state of the art laboratory techniques will be showed from recent literature within the evolutionary developmental neurobiology field.

Finally, the last part of the course will help the students practice on (15-minutes) short talks on scientific papers selected by the students and approved by the professor.
The course is composed of two parts:

**PART 1 (Prof. G. Marcon):**
**NEUROANATOMY**
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- Comparative neuroanatomy
- Basis of comparative brain morphogenesis
- Comparative brain histogenesis
- Evolutionary developmental approach: a genetic perspective
- Laboratory techniques for evolutionary research
- 15 min short talk presentation practice

**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: VERTEBRATE BRAIN EVOLUTION**
1) Lecture notes (PDF)

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No prerequisites for both PART 1 and 2.

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(slides, neuroanatomy and techniques of brain cutting video and
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Finally, the last part of the course will help the students practice on (15-minutes) short talks on scientific papers selected by the students and approved by the professor.

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

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