



## **Medicine and Surgery Degree Course**

Integrated Course: **NEUROLOGICAL SCIENCES**

SDS: **MEDS-12/A, MEDS-15/A**

Number of Credits: **6 ECTS**

Coordinator: **Andrea Romigi**

Module: **Neurology**

SDS: **MEDS-12/A**

Number of Credits: **4 ECTS**

Professor: **Andrea Romigi**

**(3 ECTS)**

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Professor: **Luigi Maria Edoardo Grimaldi (1 ECTS)**

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Module: **Neurosurgery**

SDS: **MEDS-15/A**

Number of Credits: **2 ECTS**

Professor: **Stefano Signoretti**

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### **PREREQUISITES**

It would be desirable that the student has already acquired the basic notions on Neuroanatomy and Neurophysiology.

### **LEARNING OBJECTIVES**

We propose an integrated course aimed at translating from basic to clinical knowledge.

This interdisciplinary course will link different subspecialties into an integrated and comprehensive program. By completion of the program, students will have adequate knowledge of the main neurological diseases, their pathophysiology and treatment. The Neurosurgery module provides an overview on neurological diseases and of their surgical management. It integrates with diagnostic procedures and technological advancements.

- I. The evolution of neurology.
- II. Neurology in the multi-morbidity of the elderly.
- III. Brain death: ethical and legislative aspects.
- IV. The role of electrophysiology in neurology
- V. The importance of sleep medicine in the context of neurology
- VI Ethics of research in Neuroscience

## LEARNING OUTCOMES

At the end of the course the student must be able to know the basic directions of diagnosis and therapy of the main pathologies of the central NS of neurological interest; besides, he/she will acquire the basic competence to deal with neurological emergencies and to utilize the key semeiotic tools. Further, he/she will be capable to address properly the anatomo-physiological-clinical correlations, which lead to proper diagnosis and therapy path. Also, the student should be able to diagnose and know the treatment of the main CNS and PNS diseases of neurosurgical interest, such as: hydrocephalus and intracranial hypertension syndrome, head and spine trauma, ischemic and hemorrhagic stroke, cerebrovascular malformations, brain and spinal tumors, spinal degeneration disease, CNS and spinal infections in neurosurgery, pediatric neurosurgical pathologies, peripheral neurosurgical diseases, functional neurosurgery. Neuroanatomy and neurophysiology of neurosurgical interest will be also reviewed.

### **Knowledge and Understanding:**

- Neuroanatomy and Neurophysiology: Students will acquire an in-depth knowledge of the structures and functions of the nervous system, crucial for the correct diagnosis and treatment of neurological diseases.
- Major Diseases of the Central and Peripheral Nervous System:
  - o Epilepsy and Headache: Understanding the causes, underlying mechanisms, and therapeutic options.
  - o Stroke and Other Vascular Pathologies: Detailed knowledge of different types of strokes (ischemic and hemorrhagic), understanding of vascular malformations such as aneurysms and angiomas, and in-depth exploration of prevention strategies, diagnosis, and emergency interventions.
  - o Neuroinflammatory Diseases: Insights into multiple sclerosis and other inflammatory conditions of the CNS.
  - o Infections of the Nervous System: Understanding the diagnostic and therapeutic strategies for CNS infections.
  - o Degenerative Diseases: Focus on Parkinson's disease, dementias, and other degenerative conditions of the nervous system.
  - o Neuromuscular Disorders: Including myasthenia gravis, muscular dystrophies, and neuropathies.
  - o Sleep Disorders and Consciousness Alterations: Understanding the importance of sleep medicine and managing conditions such as syncope, coma, and brain death.
    - Neurosurgery: Knowledge acquisition on major neurosurgical pathologies, including surgical techniques and diagnostic procedures for conditions like hydrocephalus, cranial and spinal traumas, and tumors of the nervous system.
    - Methods of Diagnosis and Treatment: Ability to use advanced diagnostic tools, including neuroimaging, and to apply evidence-based treatments.
    - Management of Neurological Emergencies: Knowledge and skills necessary to address and manage neurological emergencies, with a practical approach to neurological semiotics.

### **Applying knowledge and understanding:**

Students will be able to apply the knowledge acquired in neuroanatomy and neurophysiology to diagnose and manage neurological pathologies. They will use advanced diagnostic methods and evidence-based treatments, understanding the importance of their practical applications in clinical medicine and surgery.

### **Communication Skills:**

They will be capable of effectively communicating neurological information, both in clinical and academic settings, using appropriate scientific language. They will be able to explain disease



mechanisms, treatment plans, and prevention recommendations to colleagues, patients, and non-specialized health personnel, ensuring that communication is clear, precise, and adapted to the audience.

### **Making judgments:**

Students will develop autonomy in evaluating complex clinical situations, using their theoretical knowledge and critical analysis skills. They will be able to synthesize clinical and research data to form independent judgments that consider ethical, social, and scientific variables, showing responsibility in clinical decisions and patient management.

### **Learning Skills:**

They will demonstrate the ability to continue learning independently in the field of neurology, staying updated with the latest developments through research and self-education. They will be prepared to undertake further advanced studies, specializations, and research activities, with a constant commitment to improving their professional skills.

## **NEUROLOGY SYLLABUS**

At the end of the Neurology course, any candidate will acquire competence around the main neurological diseases, including: epilepsy; headache; stroke; neuro-inflammatory diseases including multiple sclerosis; infections of the nervous system; spinal cord diseases; diseases of the cerebellum, including ataxias; Parkinson's and Parkinsonisms; dementias; dystonia; myasthenia; muscular dystrophies and other myopathies; diseases of the motor neuron; inflammatory, metabolic, toxic and hereditary mono- and poly-neuropathies; headaches / migraines; sleep disorders; alterations of consciousness, syncope, coma, brain death.

## **NEUROSURGERY SYLLABUS**

The main pathologies of the CNS or peripheral nervous system will be discussed: hydrocephalus and intracranial hypertension syndrome, head and spine trauma, ischemic and hemorrhagic stroke, cerebrovascular malformations, brain and spinal tumors, spinal degeneration disease, CNS and spinal infections in neurosurgery, pediatric neurosurgical pathologies, peripheral neurosurgical diseases, functional neurosurgery. ischemic and hemorrhagic stroke.

## **NEUROLOGY INTERNSHIP OBJECTIVES**

Generic training goals already explained in the Syllabus

Specific aims for Internship into a Neurology ward:

- Patient Triage with Cerebral Stroke;
- Biomarkers in Neurodegenerative Diseases: Perform lumbar puncture for biomarker analysis (amyloid, tau proteins); comparison with on-going trials with plasma biomarker;
- Modern Diagnostics with Neuroimaging: Gain insight into the contributions of Nuclear Medicine and 3 Tesla MRI, including basics of functional MRI;
- Emerging Therapeutic Frontiers: Focus on biological immunotherapies in rare diseases;



- Clinical/Semeiotic Assessment at the Patient's Bedside. Understand the roles of medical doctors, specialists, and nursing staff in clinical assessment; observe modifications in clinical scores during hospitalization
  - Awareness of Parameters for Transferring Patients either from Emergency room to Neurology department or from Neurology ward to rehabilitation Units;

## **NEUROSURGERY INTERNSHIP OBJECTIVES**

1. Anamnesis, neurological status and general profile of the patient suffering from neurosurgical pathology.
2. Management of patients with acute, no time, pathologies, requiring urgent treatment.
3. Management of the patient with elective or chronic pathology, not requiring urgent treatment.
4. Knowledge of the evolution of the clinical pictures: rapid neurological deterioration.
5. Knowledge of the diagnostic process: elements of neuroradiology, principles of invasive diagnostics, use of monitoring.
6. The neurosurgical operating room: the concept of sterility, the approach to micro-surgery, pre-intra- and post-operative technology, image-guided surgery.
7. Post-operative complications.
8. Ethical and medico-legal concerns: iatrogenic brain and spinal cord damage; therapeutic persistence; resilience.

## **COURSE STRUCTURE**

The course is divided into lectures, divided between 40 hours of neurology and 20 hours of neurosurgery. Professors will use teaching tools such as slides with explanatory diagrams, illustrations, images and interactive tools. Films and animations from scientific journal or international universities will be used to integrate the processes described in class. Interactive tests will be organized. Attendance is compulsory.

## **COURSE GRADE DETERMINATION**

The evaluation parameters that will be used, among others, will be: ability to gather and organize knowledge; critical thinking skills; quality of exposure, competence in the use of specialized vocabulary, effectiveness, linearity). The exam will include a written test consisting of 30 multiple choice questions and 3 brief free topics for each discipline. The free topic requires a brief effective written explanation.

The whole examination will be evaluated as it follows:

- > Insufficient: severe poor knowledge of the subject, very limited skill in the analysis of specific items.
- > 18-20: knowledge of the subjects of sufficient quality characterized by frequent imperfections. Analysis and reasoning skills of sufficient quality.



- 21-23: standard knowledge of the specific subject; analysis and reasoning skill of acceptable quality.
- 24-26: good knowledge of the subjects and good analysis and reasoning skills; arguments are expressed in a rigorous way.
- 27-29: very good knowledge of the specific scientific subjects, valid analysis and reasoning skills, significant skill in making judgements.
- 30-30L: outstanding knowledge of the specific knowledge of the scientific tasks. Exceptional analysis, reasoning and making judgments skills.

## OPTIONAL ACTIVITIES

Extra sessions and Interactive tests may be organized to deliver additional information on-line. Furthermore, one of the extended lessons (3 hours) will be presented in the form of a seminar with in-depth analysis of research topics (including the invitation to competent field experts).

## NEUROLOGY READING MATERIALS

Updated neurology tests such as

- 1) Berardelli et al.(ed. Esculapio 2023) Neurology at Sapienza
- 2) Principles of Neural Sciences, Kandel et al. 6<sup>th</sup> Edition Ed. Mc Graw Hill

However, the key concept is that the training of the medical students will also benefit from the material provided by the teacher. Prof Romigi and Prof Grimaldi will solicit and provide insights with numerous references to modern updated reviews or videos easily accessible on the web; this permits the sharing of neurological semeiotics in a more effective manner, which represents a crucial knowledge necessary for any specialist (with particular reference to those who will work in the emergency room and / or emergency services).

## NEUROSURGERY READING MATERIALS

*Handbook of Neurosurgery*, 10th Edition by Mark S. Greenberg

*Comprehensive Neurosurgery Board Review*, 3<sup>rd</sup> Edition by J.S. Citow

*Spine Essentials Handbook: A Bulleted Review of Anatomy, Evaluation, Imaging, Tests* by K. Singh