



**CD 8.5.1 DISCIPLINE CURRICULUM FOR
UNIVERSITY STUDIES**

Edition: 09

Date: 06.09.2021

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FACULTY OF MEDICINE

MEDICINE EDUCATIONAL PROGRAM

DEPARTMENT OF NEUROLOGY NO. 1, DEPARTMENT OF NEUROLOGY NO. 2

APPROVED

at the meeting of the Committee for Quality Assurance and Curriculum Evaluation Faculty of Medicine

Report No. 1 from 16.08.21
Chairman, MD, PhD, associate professor
Suman Serghei _____

APPROVED

at the meeting of the Faculty of Medicine No. 2 Council

Report No. 1 from 21.08.21
Dean of the Faculty of Medicine No. 2,
MD, PhD, associate professor
Betiu Mircea _____

APPROVED

at the meeting of the Departments of Neurology No. 1 and No. 2

Report No. 2 from 09.09.2021

Chairman of the Department of Neurology No. 1,
MD, PhD Professor

Gavriliuc Mihail _____

Chairman of the Department of Neurology No. 2,
Acad., MD, PhD, Professor

Groppa Stanislav _____

CURRICULUM

DISCIPLINE NEUROLOGY

Integrated studies

Course type: **Mandatory**

Curriculum developed by the team of authors:

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Groppa Stanislav, acad., PhD, professor
Lisnic Vitalie, PhD, professor
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Chisinau, 2021



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I. INTRODUCTION

- **The overview of the discipline: the role and place of the discipline in the formation of specific competencies of the professional training program/specialty**

Neurology holds an important place among medical disciplines, considering the fact that the pathology of the nervous system enables multiple disorders of the human body functions, often determining the evolution and the prognosis of the disease. It is well known that there are almost no somatic diseases in the pathogenesis of which the nervous system is not involved. In its turn, the somatic diseases cause different conditions of the central and peripheral nervous system, resulting in a large array of somatic neurological syndromes. Knowing the basics of clinical neurology is extremely important for general practitioners, future family doctors and specialists in various fields of medicine. This is determined by the need of knowing the role of the nervous system in the norm and in pathology, being able in consequence to approach especially the diseases of medical-social importance, as are the demyelinating diseases, stroke, peripheral nervous system disorders (radiculopathies, polyneuropathies) and other diseases that are frequently encountered in medical practice. The neurological training within the faculty offers the necessary knowledge background in order to provide medical assistance in case of neurological emergencies: coma caused by cerebral strokes, neuroinfections, craniocerebral traumas, status epilepticus as well as pain syndromes of various origins (trigeminal neuralgia, discogenic radiculopathy, etc.).

Currently, neurology is considered one of the clinical disciplines with an impressive scientific development. The progress obtained in the field of the neurologic system imaging revolutionized the possibilities of diagnosis that in consequence enabled the process of choosing the appropriate treatment of various neurological diseases. Currently, the nervous system is studied at various levels and with a multilateral approach – anatomical, physiological, biochemical, evolutionary, psychological and others, which contributes to creating new possibilities in the field of therapy and prophylaxis of neurological diseases, that until now were considered very reserved. The continuous gathering of new data regarding the bioactive substances – neurotransmitters and neuromediators, as well as the elucidation of the role of brain chemistry disorders in the genesis of neurological diseases, considerably changes the conceptual content of clinical neurology.

At the present stage of the development of medical techniques, paraclinical exploration methods have become an integral part of the diagnostic process of neurological diseases. Therefore, it is necessary a doctor not only to know the methods of neurological examination of the patient, but also to apply appropriate laboratory investigations useful for the localization as well as for the identification of the type of the pathological process of the nervous system. The treatment of neurological diseases is becoming more and more differentiated, which requires a good orientation of the physician in choosing the right therapy.

- **The mission of the curriculum (the goal) in the process of professional training**

The main goal of the course is to study the physiological and pathological changes of the nervous system depending on the connection between the neural substrate and the triggering factors, multilateral examination of relevant relationships between internal structures and organization of the nervous system and the law of syndromology and topical diagnosis. Studying the discipline will ensure:

- a) acquiring practical skills of examining a neurological patient in order to recognize pathological signs with their semiotic localization assessment and identifying the nature of the pathological process;
- b) adequate evaluation of the information obtained from the additional investigations: electrophysiological, radiological, biochemical, immunological etc.
- c) making the clinical diagnosis of neurological diseases frequently encountered in the medical practice, which offers the possibility of introducing appropriate treatment and effective prophylactic measures;
- d) knowing various alternations of the nervous system within different somatic diseases, their early diagnosis, treatment, prophylaxis and prognosis.



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- **Language of instruction:** Romanian, Russian, English, French.
- **Beneficiaries:** students in the IVth year, Faculty of Medicine No. 1 and No. 2, specialty Medicine

II. MANAGEMENT OF THE DISCIPLINE

Code of the discipline	S.07.O.057		
Name of the discipline	Neurology		
In charge of the discipline	MD, PhD, Prof. Gavriliuc Mihail		
Academic year	IV	Semesters	7, 8
Total number of hours 150 , including:			
Lectures	30	Practical/laboratory hours	30
Seminars	30	Self-training	60
Form of assessment	E	Number of credits	5

III. TRAINING OBJECTIVES WITHIN THE DISCIPLINE

At the end of the course, the student will be able to:

- **At the level of knowledge and understanding:**
 - To define the theoretical foundations of contemporary neurology;
 - To identify the anatomical-functional features of the nervous system;
 - To highlight topographically the place and the importance of different anatomical structures and areas of the nervous system involved in the performing of specific functions and to define neurological syndromes;
 - To establish the topical diagnosis based on defined clinical syndromes;
 - To report on the etiopathogenesis, clinical manifestations, diagnosis, treatment principles and prophylaxis of neurological disorders.
- **At the practical application level:**
 - To collect the anamnesis and evaluate the data about the functions of the nervous system;
 - To perform the special neurological examination according to the systems;
 - To apply various diagnostic methods in neurological disorders;
 - To evaluate the results of the clinical tests and additional diagnostic investigations in order to appreciate the functional state of the nervous system;
 - To apply emergency examination methods.
- **At the level of integration:**
 - To assess the importance of neurology in the context of Medicine and integration with related medical disciplines;
 - To appreciate the evolution of physiological processes and the etiology of pathological processes of the nervous system;
 - To observe the pathological processes and to apply the right methods of investigation, treatment and prophylaxis of the nervous system disorders;
 - To evaluate the results of diagnostic methods in neurological diseases;



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- To make optimal decisions while providing emergency assistance in critical situations;
- To develop scientific research projects in the field of neurology.

IV. PRIOR TERMS AND CONDITIONS

Neurology is a clinical medical discipline, the study of which will allow the development of the necessary skills to support a correct diagnosis based on the anamnesis, clinical and paraclinical examination, acquiring the necessary notions and skills to highlight neurological emergency cases and frequent neurological diseases as well as choosing the right curative management.

A student at the 4th course in the University needs the following:

- to know the language of instruction;
- preclinical skills;
- clinical skills;
- digital skills (being able to use the internet, to process the documents, electronic tables and presentation, using graphics software);
- communication and teamwork skills;
- the ability to communicate with the patients;
- qualities – intelligence, wisdom, tolerance, compassion, autonomy.

V. THEMES AND ESTIMATED DISTRIBUTION OF HOURS

Lectures, practical hours/laboratory hours/seminars and self-training

No.	THEME	NUMBER OF HOURS		
		Lectures	Practical hours	Self-training
1.	The subject of clinical neurology. Historical data of Neurology. Neurological examination. Complementary and laboratory investigations used in neurology and neurosurgery. Sensitivity. Signs, symptoms and syndromes affecting sensitivity. Mono / multineuropathy of the upper and lower limbs. Tunnel syndromes. ENG, PESS: principles and clinical utility. Pain – a complex clinical phenomenon, neurological approach.	2	4	4
2.	Motility. The pyramidal system (corticospinal tract). Central motor neuron syndrome, peripheral motor neuron syndrome. Sphincter disorders of neurologic origin. Motor neuron disease. Electromyography (EMG) examination: principles and clinical utility.	2	4	4
3.	Motility. Extrapyramidal system. Hypertonic-hypokinetic syndrome. Parkinson's disease. Hypotonic-hyperkinetic syndrome. Tics. Cerebellum: anatomical and physiological principles of constitution, examination, clinical manifestations of impairment. Friedreich ataxia.	2	4	4
4.	The brainstem and the cranial nerves: anatomical and physiological principles of constitution, clinical examination, clinical signs and symptoms of impairment. Notion of alternating syndrome. Bulbar and pseudobulbar syndrome. Vertigo. Facial neuritis/neuropathy. Trigeminal neuralgia.	2	4	4
5.	Autonomic nervous system (ANS): anatomophysiological features and examination methods. Syndromes of impairment of ANS in neurological and somatic diseases. Syncope. Panic attack. Headache: classification, diagnostic criteria of primary headaches.	2	4	4
6.	The cerebral cortex. Clinical signs, symptoms and syndromes of impairment. Dementias. Disturbances of the central nervous system in alcoholism.	2	4	4



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No.	THEME	NUMBER OF HOURS		
		Lectures	Practical hours	Self-training
	Magnetic resonance investigation: principles, clinical utility.			
7.	Neurological examination of a patient with an altered level of consciousness. Coma. Notions of vegetative status, akinetic mutism, locked-in syndrome, psychic areactivity. Brain death. Computer tomography examination: principles, clinical utility.	2	4	4
8.	Cerebrovascular diseases. Epidemiological data, risk factors, classification. Ischemic stroke. Treatment in the acute period, primary and secondary prophylaxis. Intracranial venous thrombosis: clinical manifestations, complementary investigations and treatment.	2	4	4
9.	Hemorrhagic stroke. Principles of neurorehabilitation. Doppler ultrasound examination of cervical and cerebral vessels: principles and clinical utility.	2	4	4
10.	Infectious diseases of the nervous system: general notions, classification. Meningitis and encephalitis. Herpetic encephalitis. Nervous system damage in COVID-19 infection. Lumbar puncture. Examination of cerebrospinal fluid.	2	4	4
11.	Spinal cord diseases. Myelitis and myelopathy. Poliomyelitis. Neurosyphilis. Damage of the nervous system in HIV/AIDS. Neuroborreliosis. Spinal cord vascular syndromes.	2	4	4
12.	Multiple sclerosis. Myasthenia Gravis. Paraneoplastic syndrome. Evoked potential signals, electromyographic nerve conduction study: principles, clinical utility.	2	4	4
13.	Epilepsy. Status epilepticus. Intensive care treatment. Autoimmune encephalitis. Electroencephalography: principles, clinical utility. Infantile cerebral palsy.	2	4	4
14.	Peripheral nervous system disorders. Discogenic radiculopathies. Guillain-Barre syndrome. Polineuropathy. Brachial plexopathy. Disturbances of the peripheral nervous system in alcoholism.	2	4	4
15.	Hereditary diseases in clinical neurology: progressive muscular dystrophies, Charcot-Marie-Tooth hereditary neuropathy, myotonias. Wilson disease.	2	4	4
Total		30	60	60

VI. OBJECTIVES AND CONTENT UNITS

Objectives	Content units
Theme 1.	
The subject of clinical neurology. Historical data of Neurology. Neurological examination. Complementary and laboratory investigations used in neurology and neurosurgery. Sensitivity. Signs, symptoms and syndromes of sensitivity lesion. Mono / multilineuropathy of the upper and lower limbs. Tunnel syndromes. ENG, PESS: principles and clinical utility. Pain – a complex clinical phenomenon, neurological approach.	
<ul style="list-style-type: none"> to know the anatomical and physiological features of the sensitivity to know the clinical manifestations of superficial and deep sensitivity disorders 	Data regarding the history of neurology. Innovations in neurology. Definition of sensitivity. Superficial and deep sensitivity pathways.



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Objectives	Content units
<ul style="list-style-type: none"> • to apply diagnostic methods (clinical, objective neurological status, paraclinical) of the diseases associated with sensitivity impairment; • to evaluate the results of additional diagnostic investigations in order to appreciate the functional state of sensitivity; • to determine the topical diagnosis of the pathological process based on the sensitivity disturbances • to evaluate the results of the objective methods of examination of the superficial, deep and complex sensitivity • to know the complementary and laboratory techniques used in neurology and neurosurgery • to know the etiology and clinical manifestations of mono / multineuropathy of the upper and lower limbs • to define the principles and value of electrophysiological examination by electroneurography (ENG) and somatosensory evoked potentials (SSEP) • to know the peculiarities of nociceptive and neuropathic pain, the general principles of pain treatment 	<p>The semiology of sensitivity disturbances, sensitive syndromes. Examination techniques of sensitivity. Upper and lower limb neuropathies. Tunnel syndromes. Etiology. Clinical picture. Paraclinical diagnosis and treatment. ENG and SSEP: principles and clinical utility. Definition of pain and the afferent pathways of pain, clinical aspects of pain. Antinociceptive pathways. The gate control theory of pain. General principles of pain treatment.</p>
<p>Theme 2. Motility. The pyramidal system (corticospinal tract). Central motor neuron syndrome, peripheral motor neuron syndrome. Sphincter disorders of neurologic origin. Motor neuron disease. Electromyography (EMG) examination: principles and clinical utility.</p>	
<ul style="list-style-type: none"> • to know the anatomical and physiological features of the central and peripheral motor neurons • to apply in practice the theoretical knowledge about the anatomy and physiology of the pyramidal system • to know the notion of motor unit and the notion of paresis and paralysis • to be able to define the clinical syndromes affecting the central and peripheral motor neurons • to differentiate between the damage of the central motor neuron (central paralysis) and the peripheral motor neuron (peripheral paralysis) • to know the technique of the voluntary motility examination • to know the semiology of spinal cord suffering at different levels in transverse hemisection (Brown Sequard syndrome) and in full transverse section • to apply the algorithm of diagnosis of the symptoms and signs of the peripheral motor neuron syndrome and central motor neuron syndrome in assessing patients with motility disorders • to assess correctly the management of peripheral and central type sphincter disorders • to know the etiology, clinical manifestations, diagnosis and treatment of motor neuron disease • to define the principles and the utility of the electrophysiological examination by electromyography (EMG) in the diagnosis of nervous system diseases 	<p>The notion of motor unit and the pathway of the voluntary motility. The notion of paresis and paralysis. Clinical and electrophysiological symptoms of peripheral motor neuron syndrome. Clinical symptoms of central motor neuron syndrome. Nosological entities that are manifested by central motor neuron syndrome and peripheral motor neuron syndrome. Anatomical and functional features and clinical manifestations of central and peripheral type sphincter disorders. The semiology of spinal cord injury in the transverse hemisection at the following levels: upper cervical, cervical intumescence, thoracic, lumbar intumescence, below the lumbar intumescence. Clinical manifestations of total transverse spinal cord injury at the following levels: upper cervical, cervical intumescence, thoracic, lumbar intumescence, below the lumbar intumescence. The definition of motor neuron disease. Clinical manifestations, diagnosis, treatment.</p>



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Objectives

Content units

Theme 3.

Motility. Extrapyramidal system. Hypertonic-hypokinetic syndrome. Parkinson's disease. Hypotonic-hyperkinetic syndrome. Tics. Cerebellum: anatomical and physiological principles of constitution, clinical examination, clinical manifestations of impairment. Friedreich ataxia.

<ul style="list-style-type: none"> • to define the anatomical and physiological features of the extrapyramidal system • to define the hypertonic-hypokinetic syndrome and the hyperkinetic-hypotonic syndrome • to know the semiology of involuntary movements: tremor (Parkinsonian, attitude, action tremor), chorea, athetosis, dystonia, iatrogenic dyskinesias, tics, facial hemispasm, myoclonus, hemibalism • to know the pathogenesis, clinical manifestations, treatment of Parkinson's disease • to know the etiology, clinical manifestations, treatment of Sidenham chorea, tics, Huntington chorea • to define the anatomical and physiological principles of constitution of the cerebellum • to know the semiology of cerebellar damage: ataxia, dysmetria, asinergia, adiadochokinesis, intention tremor, language and writing disorders • to know the methodology of the clinical cerebellum examination • to know the semiology of gait disorders and the clinical features of topical and etiological diagnosis • to know the pathogenesis, clinical manifestations, treatment of Friedreich's ataxia 	<p>Anatomical and physiological features of the extrapyramidal system.</p> <p>The notion of hypertonic-hypokinetic syndrome.</p> <p>The notion of hyperkinetic-hypotonic syndrome.</p> <p>Semiology of involuntary movements: Parkinsonian, attitude and action tremor, chorea, athetosis, dystonia, iatrogenic dyskinesias, tics, facial hemispasm, myoclonus, hemibalism.</p> <p>Parkinson's disease: pathogenesis, clinical manifestations, treatment.</p> <p>Sidenham chorea: etiology, clinical manifestations, treatment.</p> <p>Huntington chorea. Etiology, clinical manifestations, treatment.</p> <p>Tics.</p> <p>Cerebellum: anatomical and physiological principles of the constitution, clinical examination, clinical manifestations.</p> <p>Friedreich's ataxia: clinical manifestations, diagnosis.</p>
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Theme 4.

The brainstem and the cranial nerves: anatomical and physiological principles of constitution, clinical examination, clinical signs and symptoms of impairment. Notion of alternating syndrome. Bulbar and pseudobulbar syndrome. Vertigo. Facial neuritis/neuropathy. Trigeminal neuralgia.

<ul style="list-style-type: none"> • to know the algorithm of diagnosing the signs and symptoms of cranial nerve damage • to apply in clinical practice the knowledge accumulated by the students at the preclinical subjects about the anatomy and physiology of the cranial nerves • to know the technique of the clinical examination of the function of the cranial nerves • to identify correctly and to know the management of the bulbar and pseudobulbar disorders • to know the definition and the topographic classification of the alternating syndromes • to know the general notions of vertigo • to know the clinical manifestations and the treatment principles of benign paroxysmal positional vertigo, neuritis/facial neuropathy, trigeminal neuralgia • accumulation of personal clinical experience regarding the pathology of the cranial nerves by the students 	<p>Anatomical and physiological features of the brainstem.</p> <p>Criteria of classifying the cranial nerves.</p> <p>Generalities of the constitution and functioning of the sensitive-sensory cranial nerves.</p> <p>Generalities of the constitution and functioning of the motor cranial nerves.</p> <p>Semiology of cranial nerve injury.</p> <p>General features of the brainstem alternating syndromes.</p> <p>Clinical manifestations of the bulbar and pseudobulbar syndromes.</p> <p>Clinical manifestations and treatment principles of benign paroxysmal positional vertigo, neuritis/facial neuropathy, trigeminal neuralgia.</p>
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Theme 5.



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Objectives

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Autonomic nervous system (ANS): anatomical and physiological features and examination methods. Syndromes of impairment of ANS in neurological and somatic diseases. Syncope. Panic attack. Headache: classification, diagnostic criteria of primary headaches.

- to know the anatomical, physiological features of the autonomic nervous system
- to know the classification of the autonomic disorders
- to know the clinical manifestations of the autonomic nervous system damage in neurological diseases
- to know the clinical manifestations of the autonomic nervous system damage in somatic diseases
- to apply diagnostic methods (clinical, objective neurological status, paraclinic) of the autonomic nervous system disorders
- to evaluate the results of additional diagnostic investigations in order to evaluate the functional status of the autonomic nervous system
- to evaluate the results of the applied diagnostic methods of the autonomic nervous system disorders
- to evaluate the evolution of the physiological processes and the etiology of the pathological processes of the autonomic nervous system
- to evaluate the role of the autonomic nervous system in the pathogenesis of psychosomatic diseases
- to define the notion of syncope, etiology and differential diagnosis
- to know the manifestations and treatment of panic attack
- to know the notion of headache: the classification and the diagnostic criteria of primary headaches, principles of treatment

Anatomical and clinical physiological features of sympathetic and parasympathetic autonomic nervous system.
 Syndromes of impairment of ANS in neurological and somatic diseases. Classification of the autonomic disorders.
 Methods of investigation of the autonomic nervous system: clinical and instrumental.
 The reticular formation of the brainstem.
 Anatomical and physiological features, syndromes of reticulate formation impairment: narcolepsy, idiopathic hypersomnia and dyssomnias.
 Anatomical and physiological features of the hypothalamus and hypothalamic dysfunction syndromes.
 Syncope: etiology and differential diagnosis.
 Panic attacks, diagnostic criteria, treatment.
 Headache: classification, diagnostic criteria of primary headache and principles of treatment.

Theme 6.

The cerebral cortex. Clinical signs, symptoms and syndromes of impairment. Dementias. Disturbances of the central nervous system in alcoholism. Magnetic resonance investigation: principles, clinical utility.

- to know the cortical analyzers and to appreciate the signs of damage to the cortical analyzers
- to know the superior functions of the cerebral cortex (language, praxis, gnosis, writing, calculus, etc.) and their signs of damage.
- to define aphasia
- to define agnosia
- to define apraxia
- to define amnesia
- to know the clinical methods for examining the cortical analyzers, clinical manifestations of lesion and excitatory impairment of cortical analyzers, the clinical features and analysis of changes in intellectual capacity, perception, memory and personality, which may occur in organic brain damage and dementia
- to know the notions of clinical neuropsychology and to analyze the changes in intellectual, perceptual, memory and personality abilities that may occur in organic brain lesions
- to apply methods of examining the superior cerebral functions in order to correctly appreciate the clinical diagnosis and to administer the appropriate etiopathogenic therapy

Cortical analyzers and signs of damage of the cortical analyzers.
 The main functions of the cerebral cortex (language, praxis, gnosis, writing, calculus, etc.).
 Signs of cortical analyzers impairment, major syndromes: aphasia, apraxia, agnosia.
 Location of cortical analyzers of taste, smell, hearing, vision.
 Clinical methods for examining the cortical analyzers.
 Changes in intellectual, perceptual, memory, and personality abilities that may occur in organic brain damage.
 Vascular and degenerative dementia: clinical manifestations, differential diagnosis and treatment.
 Acute and chronic clinical manifestations of CNS damage in alcoholism: Gayet-Wernicke encephalopathy, Korsakoff syndrome, cerebellar degeneration.



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Objectives	Content units
<ul style="list-style-type: none"> to know the notion of vascular and degenerative dementia, clinical manifestations, differential diagnosis and treatment to integrate knowledge about acute and chronic clinical manifestations of CNS impairment in alcoholism to define the principles and clinical utility of the Magnetic Resonance examination 	<p>Principles and clinical utility of the Magnetic Resonance examination.</p>
<p>Theme 7. Neurological examination of a patient with an altered level of consciousness. Coma. Notions of vegetative status, akinetic mutism, locked-in syndrome, psychic areactivity. Brain death. Computer tomography examination: principles, clinical utility.</p>	
<ul style="list-style-type: none"> to define the state of normal and altered consciousness to know the anatomical substrate of consciousness to know the etiopathogenetic mechanisms of coma to demonstrate the ability of examining a patient without consciousness to use the obtained information for the differentiation between different states of consciousness alteration to interpret the imaging and laboratory investigations results in the process of diagnosing the coma state to understand the utility of Glasgow Coma Scale (GCS) in appreciating the state of consciousness to interpret the results of GCS to know the principles of treatment of comatose states based on their etiology to know the protocol for establishing the diagnosis of brain death to have notions of medical ethics in the context of communicating the diagnosis of brain death to know the principles and indications of computerized tomography to interpret the results of Computer Tomography investigations 	<p>The definition of coma. Pathogenesis of coma. Classification of comes. Differential diagnosis of neurogenic and metabolic coma. The clinical examination of the patient without consciousness. Coma Glasgow Scale. Paraclinical diagnosis. The principles of treatment of comatose states. Pseudocomatose states: the definition, causes, pathological physiology of vegetative status, akinetic mutism, locked-in syndrome. Brain death. Computer Tomography examination: principles, clinical utility.</p>
<p>Theme 8. Cerebrovascular diseases. Epidemiological data, risk factors, classification. Ischemic stroke. Treatment in the acute period, primary and secondary prophylaxis. Intracranial venous thrombosis: clinical manifestations, complementary investigations and treatment.</p>	
<ul style="list-style-type: none"> to give the definition of stroke and to name the types of stroke to define the unmodifiable and modifiable risk factors and to understand their significance of inducing a stroke to know the causes that may lead to stroke to know the brain vascularization and the selfregulation mechanisms to know the clinical manifestations of the stroke to demonstrate skills for identifying motility, sensitivity, cranial nerves and superior cognitive function disorders in a patient with stroke to interpret the imaging changes of stroke on computed tomography and on magnetic resonance imaging to define the notion of 'therapeutic window' and its significance in the management of a patient with acute stroke to understand the utility of the NIHSS score in assessing the severity of a stroke 	<p>Classification of ischemic stroke. Pathogenesis of ischemic stroke. Atherothrombotic stroke. Cardioembolic stroke. Clinical manifestations. Paraclinical investigations. Acute management of patients with stroke: specific drug treatment and endovascular approach. Acute treatment of a patient outside the therapeutic window or in case of contraindications for specific treatment. Secondary prophylaxis of stroke. Intracranial venous thrombosis: clinical manifestations, complementary investigations and treatment.</p>



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<ul style="list-style-type: none"> to know how a thrombolysis is done and what are the indications and contraindications of the procedure to take an optimal decision during the hyperacute stroke period and to know the management of a stroke at the pre-/intra-hospital stage to demonstrate good communication skills while explaining to the patient the cause of the stroke, the risk factors and the ways of influencing them to prescribe drugs for primary and secondary prophylaxis of cerebrovascular diseases to know clinical manifestations, complementary investigations and treatment of intracranial venous thrombosis 	
<p>Theme 9. Hemorrhagic stroke. Principles of neurorehabilitation. Doppler ultrasound examination of cervical and cerebral vessels: principles and clinical utility.</p>	
<ul style="list-style-type: none"> to define hemorrhagic stroke and its types to know the causes and pathogenesis of hemorrhagic stroke to know the clinical manifestations of subarachnoid hemorrhage to interpret the imaging changes of the hemorrhagic stroke on computed tomography and on magnetic resonance imaging to understand the usefulness of the Hunt-Hess scale in assessing the severity of subarachnoid hemorrhage to know the principles of Doppler ultrasound investigation and its significance for a patient with cerebrovascular pathology to make an optimal decision during the superacute period of the stroke and to know the management at the pre- and intra-hospital stage to demonstrate good communication skills while explaining to the patient the cause of the stroke, the risk factors and the ways of influencing them to know the principles of neurological rehabilitation of a patient that suffered a stroke to prescribe drugs for the primary and secondary prophylaxis of cerebrovascular diseases 	Classification of hemorrhagic stroke. Pathogenesis of hemorrhagic stroke. Clinical manifestations of subarachnoid hemorrhage. Paraclinical investigations. Assessment of the severity of subarachnoid hemorrhage. Specific treatment in the acute period: drug and surgical. Neurorehabilitation treatment. Doppler ultrasonography examination of the cervicocerebral vessels: principles and clinical utility.
<p>Theme 10. Infectious diseases of the nervous system: general notions, classification. Meningitis and encephalitis. Herpetic encephalitis. Nervous system damage in COVID-19 infection. Lumbar puncture. Examination of cerebrospinal fluid.</p>	
<ul style="list-style-type: none"> to define meningitis and encephalitis to know the principles of meningitis and encephalitis classification to know the causal agents of bacterial and aseptic meningitis to know the etiology of encephalitis to understand the pathogenesis of meningitis and encephalitis to know the meningitic triad to know the clinical manifestations of meningitis and encephalitis to demonstrate good skills in the correct appreciation and interpretation of the meningeal signs 	Definition of meningitis. Classification. Etiology. Pathogenesis. Clinical manifestations. Acute bacterial meningitis. Aseptic meningitis. Definition of encephalitis. Classification. Etiology. Pathogenesis. Herpetic encephalitis. Neurological manifestations in coronavirus infection (COVID-19). Paraclinical diagnosis of neuroinfections. Treatment.



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- to know the evolutionary clinical features of meningitis according to the causal agent
- to identify the topographic diagnosis of cerebral lesions in patients with encephalitis
- to know the manifestations of nervous system damage in coronavirus infection (COVID-19)
- to know the technique of lumbar puncture, the indications and contraindications for the procedure
- to know the normal composition and pathological syndromes of cerebrospinal fluid
- to be able to interpret the result of the cerebrospinal fluid examination
- to know the complementary imaging and laboratory methods needed to diagnose neurological infections
- to prescribe the treatment for meningitis and encephalitis
- to know the complications of meningitis and encephalitis

Content units

Complications of meningitis and encephalitis.

Theme 11.

Spinal cord diseases. Myelitis and myelopathy. Poliomyelitis. Neurosyphilis. Damage of the nervous system in HIV/AIDS. Neuroborreliosis. Spinal cord vascular syndromes.

- to define myelitis and myelopathy
- to know the classification of myelitis
- to know the etiological factors of myelitis and myelopathy
- to understand the mechanisms of pathogenesis of myelitis according to the cause
- to know the clinical manifestations of myelitis and myelopathy
- to identify the topical diagnosis of the medullary lesion at a patient with myelitis and myelopathy
- to know the paraclinical methods used in the diagnosis of myelitis / myelopathy and to argue their usefulness
- to interpret the results of laboratory and imaging examinations that are suggestive for myelitis
- to know and to justify the differential diagnosis of myelitis
- to know the principles of treatment of myelitis
- to define poliomyelitis and post-polio syndrome
- to understand the pathogeny of poliomyelitis and of the post-polio syndrome
- to know the clinical manifestations of poliomyelitis
- to demonstrate practical skills for the assessment of the peripheral paresis and meningeal signs
- to interpret the results of laboratory and imaging examinations suggestive for poliomyelitis
- to know the principles of treatment of poliomyelitis and post-polio syndrome and the importance of the prophylactic measures
- to define neurosyphilis
- to tell and to understand the pathogeny of neurosyphilis
- to know the clinical signs of different clinical forms of neurosyphilis
- to be able to apply the MMSE (Mini Mental Status Examination) to assess the cognitive impairment in patients with neurosyphilis

Definition of myelitis.
Classification.
Etiology.
Pathogenesis.
Clinical manifestations.
Paraclinical diagnosis.
Principles of treatment.
Poliomyelitis. Etiology. Pathogenesis.
Clinical manifestations.
Paraclinical diagnosis.
Treatment and prophylaxis.
Neurosyphilis. Etiology. Pathogenesis.
Clinical manifestations.
Paraclinical diagnosis.
The treatment of Neurosyphilis.
Definition of HIV-AIDS infection.
Classification.
The causes of nervous system disorders in HIV-infected patients.
Clinical forms.
Paraclinical diagnosis.
Principles of treatment.
Definition of Neuroborreliosis.
Etiology. Pathogenesis.
Clinical manifestations.
Paraclinical diagnosis.
Treatment and prophylaxis.
Acute and chronic spinal cord vascular diseases, their clinical forms.
Peculiarities of spinal cord vascularization.
Risk factors and their significance for the development of spinal cord vascular diseases.



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Objectives	Content units
<ul style="list-style-type: none"> • to interpret the results of cerebrospinal fluid, serology investigations and imaging laboratory of the patients with neurosyphilis • to prescribe the treatment for patients with neurosyphilis • to define HIV/AIDS • to know the classification of HIV infection • to know the pathogeny of the NS involvement in HIV infection • to know the clinical forms of nervous system involvement in the infected HIV patients and the evolutionary peculiarities of each form • to interpret the results of paraclinical investigations in HIV-infected patients with lesions of the nervous system • to demonstrate good communication skills while announcing the diagnosis of a HIV-AIDS patient • to know the principles of treatment of the HIV-infected patient with various NS lesions depending on the clinical form • to define the Lyme disease and Neuroborreliosis • to understand the pathogenesis of the disease and its prophylaxis • to know the classification of Neuroborreliosis • to know the clinical signs of Neuroborreliosis • to demonstrate the skills for assessing the neurological deficit in a patient with Neuroborreliosis • to demonstrate the skills in selecting the necessary paraclinical diagnostic methods for establishing the diagnosis of Neuroborreliosis • to interpret the laboratory, electrophysiological and imaging results of a patient with Neuroborreliosis • to prescribe the treatment for patient with a confirmed diagnosis of Neuroborreliosis • to know the peculiarities of vascularization of the spinal cord • to define the clinical forms of spinal cord vascular diseases • to integrate the skills of diagnosis and treatment of spinal cord vascular diseases 	<p>Diagnosis and treatment of spinal cord vascular diseases.</p>

Theme 12.

Multiple sclerosis. Myasthenia Gravis. Paraneoplastic syndrome. Evoked potentials, electromyographic nerve conduction study: principles, clinical utility.

<ul style="list-style-type: none"> • to define multiple sclerosis • to explain the pathogenesis of multiple sclerosis • to know the McDonald 2017 diagnostic criteria • to describe the characteristic imaging changes in multiple sclerosis • to interpret electrophysiological tests in multiple sclerosis (evoked potential signals) • to describe the clinical forms of multiple sclerosis • to know the symptomatic treatment of multiple sclerosis • to know the possibilities of immunomodulatory treatment in multiple sclerosis • to define myasthenia gravis • to explain the pathogenesis of myasthenia gravis with anti-ACTR and anti-MuSK antibodies 	<p>The definition of multiple sclerosis. The pathogenesis of multiple sclerosis. Clinical signs and clinical forms of multiple sclerosis. Multiple sclerosis diagnostic criteria (McDonald 2017). The treatment of multiple sclerosis exacerbations. Immunomodulatory treatment of multiple sclerosis. Definition of myasthenia gravis. Pathophysiogenetic mechanisms in Myasthenia. Clinical manifestations of myasthenia gravis.</p>
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Objectives

- to describe the clinical signs in myasthenia gravis
- to interpret the electrophysiological tests in myasthenia gravis (EMG decrement)
- to define the myasthenic crisis and the cholinergic crisis
- to know the principles of treatment of myasthenia gravis
- to define the paraneoplastic syndrome
- to explain the pathophysiological mechanisms of paraneoplastic syndrome
- to know the forms of central and peripheral nervous system involvement in paraneoplastic syndromes
- to know the principles of serological and imaging diagnosis in paraneoplastic syndrome

Content units

Diagnosis of myasthenia gravis.
Principles of treatment in myasthenia gravis.
Myasthenic crisis.
Emergency treatment of the myasthenic crisis.
The definition of paraneoplastic syndrome.
The pathogenesis of paraneoplastic syndrome.
Neurological manifestations in paraneoplastic syndromes.
The diagnosis of paraneoplastic syndromes.
Evoked potentials: principles and clinical utility.
Electromyographic nerve conduction study: principles and clinical utility.

Theme 13.

Epilepsy. Status epilepticus. Intensive care treatment. Autoimmune encephalitis. Electroencephalography: principles, clinical utility. Infantile cerebral palsy.

- to define the notion of seizures
- to define epilepsy
- to know the classification of seizures
- to understand the mechanisms of epileptogenesis
- to know the clinical manifestations of epilepsy
- to be able to make the differential diagnosis of consciousness states
- to explain the electrophysiological changes of generalized and focal seizures
- to define the notion of status epilepticus
- to know the treatment algorithm of status epilepticus
- to know the principles and algorithm of epilepsy treatment
- to define the temporal lobe epilepsy
- to name the clinical changes in temporal lobe epilepsy
- to prescribe the treatment for the temporal lobe epilepsy
- to define autoimmune encephalitis
- to integrate knowledge about the etiology, pathophysiological mechanisms, clinical manifestations, diagnosis and treatment of autoimmune encephalitis

Classification of epilepsy and of epileptic seizures.
Clinical and electrophysiological manifestations of generalized epileptic seizures.
Clinical and electrophysiological manifestations of partial epileptic seizures.
Temporal lobe epilepsy. Clinical manifestations, diagnosis, treatment.
The principles and the algorithm of the epilepsy treatment.
Status epilepticus. Intensive treatment.
Autoimmune encephalitis: etiology, pathophysiological mechanisms, clinical manifestations, diagnosis, treatment.

Theme 14.

Peripheral nervous system disorders. Discogenic radiculopathies. Guillain-Barre syndrome. Polyneuropathy. Brachial plexopathy. Disturbances of the peripheral nervous system in alcoholism.

- to know the anatomic and physiological features of the peripheral nervous system (PNS) organization
- to know the classification of the peripheral nervous system disorders
- to define the clinical forms of brachial plexopathy
- to know the etiology of brachial plexopathy
- to know the etiology and clinical manifestations of discogenic radiculopathy

Anatomical and physiological landmarks of the peripheral nervous system.
Brachial plexopathy. Definition. Clinical forms. Etiology. Clinical signs.
Paraclinical diagnosis and treatment.
The upper and lower limb neuropathies.
Tunnel syndromes. Etiology. Clinical signs. Paraclinical diagnosis and treatment.



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Objectives	Content units
<ul style="list-style-type: none"> • to define polyneuropathies and to know their classification • to know the etiology and the pathophysiological mechanisms of peripheral nerve damage • to know the peculiarities of the clinical manifestations of neuropathies in diabetes, alcohol and phosphororganic substances intoxications • to appreciate the usefulness of the cerebrospinal fluid examination in the diagnosis of acute inflammatory demyelinating polyneuropathy (Guillain-Barre syndrome) • to demonstrate abilities to establish the topographic diagnosis within the PNS diseases • to demonstrate practical skills while assessing the peripheral paresis • to integrate the results of the clinical and paraclinical examination in determining the diagnosis of peripheral nervous system disorders • to know the principles of the medicamentous treatment and of the neurorehabilitation of the peripheral nervous system disorders 	<p>Discogenic radiculopathy. Etiology. Clinical signs. Paraclinical diagnosis and treatment.</p> <p>Polyneuropathies: diabetic, alcoholic, organophosphorus compounds poisoning. Etiology. Pathophysiology. Clinical signs. Paraclinical diagnosis and treatment. Guillain-Barre syndrome. Etiology. Pathophysiology. Clinical signs. Paraclinical diagnosis and treatment. ENG: principles and clinical utility.</p>
<p>Theme 15. Hereditary diseases in clinical neurology: progressive muscular dystrophies, Charcot-Marie-Tooth hereditary neuropathy, myotonias. Wilson disease.</p>	
<ul style="list-style-type: none"> • to know the classification of the hereditary diseases of the nervous system • to define the types of transmission in various hereditary diseases of the nervous system • to know the clinical forms of myopathies, neural amyotrophies, myotonia • to know the clinical forms of Wilson's disease • to demonstrate practical skills for assessing peripheral and central paresis, signs of basal ganglion involvement, clinical maneuvers for identifying muscle disease (myopathy, myotonia) • to perform the differential diagnosis of progressive muscular dystrophies, neural amyotrophies (sensory-motor neuropathies), myotonia • to perform the differential diagnosis of extrapyramidal disorders in Wilson's disease with other hereditary and acquired extrapyramidal diseases • to define the investigations used in neurology for the diagnosis of hereditary diseases (laboratory tests, genetic tests, electrophysiological examinations). 	<p>Progressive muscular dystrophies: Duchenne myodystrophy, Erb-Rot myodystrophy. Type of transmission. Clinical signs. Paraclinical investigations, genetic tests.</p> <p>Charcot-Marie-Tooth neural amyotrophy. Type of transmission. Clinical signs. Paraclinical investigations, genetic tests.</p> <p>Myotonia. Pathogenesis. Clinical signs. Diagnosis and treatment.</p> <p>Wilson disease. Type of transmission. Clinical signs. Paraclinical diagnosis. Treatment.</p>

VII. PROFESSIONAL COMPETENCIES (SPECIFIC (CS) AND TRANSVERSAL (CT)) AND STUDY FINALITIES

✓ **Professional competencies (specific) (CS)**

- **CP1.** Responsible execution of professional tasks with the application of the values and norms of professional ethics, as well as the provisions of the legislation in force.
- **CP2.** Adequate knowledge of the sciences about the structure of the body, physiological functions and behavior of the human body in various physiological and pathological conditions, as well as the relationships between health, physical and social environment.
- **CP3.** Resolving clinical situations by developing a plan for diagnosis, treatment and rehabilitation in various pathological situations and selecting appropriate therapeutic procedures for them, including providing emergency medical care.



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- **CP4.** Promoting a healthy lifestyle, applying prevention and self-care measures.
- **CP5.** Interdisciplinary integration of the doctor's activity in a team with efficient use of all resources.
- **CP6.** Carrying out scientific research in the field of health and other branches of science.

✓ **Transversal competencies (CT):**

- **CT1.** Autonomy and responsibility in the activity.
- **CT2.** Effective communication and digital skills.
- **CT3.** Achieving interaction skills and social responsibility.
- **CT4.** Personal and professional development.

✓ **Study finalities**

- To know the definitions and classifications of pathologies of central nervous system.
- To understand etiopathogenesis of central nervous system diseases.
- To possess the ability of neurological examination of the patient with the disease of central nervous system based on mastered clinical procedures (disease history, physical examination, determination of topography diagnosis).
- To define indications and contraindications of different methods of diagnosis in neurology.
- To manifest the ability to elaborate an additional diagnostic plan (laboratory, electrophysiological and imaging) of the patient with neurological disease and capacity to argue the diagnosis based on performed investigation.
- To know the treatment principles of different neurological diseases in accordance with modern-day exigencies.
- To know the principles of prophylaxis of nervous system disease and perform health promotion activities and preventive measures for health improvement on individual and community level.
- To know the basic principles of rehabilitation of patients with nervous system diseases.
- To realize the importance of studying neurology in the process of training the future doctors that should be capable to define both primary affectation of nervous system, as well in other somatic diseases.
- To possess the capacity of analysis and synthesis of the clinical activity results in scientific research projects.
- To possess the ability to work in a team, based on initiative spirit, dialogue, cooperation, positive attitude and respect for others.

VIII. INDIVIDUAL WORK OF THE STUDENT

No.	The expected product	Implementation Strategies	Evaluation criteria	Deadline
1.	Working with information sources	Careful reading of the lecture or material from the handbook on the current topic. Reading the questions on the topic, which require reflection on the subject. Familiarization with the list of additional informational sources on said subject. Choosing the information source on said topic.	The ability to extract the essentials; interpretative skills; work volume.	During the module



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		Careful reading of the entire text and writing of the essential content. Wording of generalizations and conclusions regarding the importance of the theme / subject.		
2.	Working with the patient	Communication and examination of the patient with neurological pathology according to the thematic plan: interrogation, objective neurological examination of the patient, systematization of information obtained in clinical syndromes, establishment of topographic diagnosis. Establishing an investigation plan. Analysis of the obtained results. Diagnosis argument. Choice of non-pharmaceutical and pharmaceutical treatment. Make conclusions at the end of each lesson. Assessment at the final lessons of the sessions and appreciation of their achievements. Selection of additional information, using electronic addresses and additional bibliography.	Work volume, solving clinical cases, tests, the ability to formulate conclusions.	During the module
3.	Apply different learning techniques	Situational problems Projects	Level of scientific argumentation, quality of conclusions, elements of creativity, demonstration of understanding the problem, forming personal attitude.	During the module
4.	Working with online materials	Online self-assessment, study of online materials, expressing your own opinions through forum and chat	Number and duration of forum entries and chat, self-assessment results.	During the module
5.	Preparation and support of clinical cases and clinical observation files	Selection of the patient with neurological pathology for clinical observation record, establishment of the research plan, setting the terms of realization. Establishing the patient for case presentation. PowerPoint - topic, purpose, results, conclusions, practical applications, bibliography.	Work volume, level of scientific argumentation, creativity elements, forming personal attitude, consistency of exposure and scientific correctness, graphic presentation, method of presentation.	During the module

IX. METHODOLOGICAL SUGESTIONS OF TEACHING-LEARNING-EVALUATION

- ***Used methods of teaching and learning***

Various methods and procedures are used to teach Neurology that are oriented towards efficient



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learning and reaching the goals of curricular process. Within the theoretical lessons, along with traditional methods (exposition lesson, conversation lesson, synthesis lesson), modern methods (debate lesson, conference lesson, problem lesson) are also used. Within the practical lessons there are used various forms of individual activity, frontal, group, virtual clinical cases, projects. For better learning of the information, there are used different semiotics systems (scientific language, graphic language and computer) and visual aids (tables, schemes, radiographic, tomographic, MRI, electroencephalographic, electromyography images). Information communication technologies are used during the lessons and extracurricular activities – Power Point presentations.

• **Recommended learning techniques:**

- **Observation** – Identification of symptoms and physical signs typical for neurological diseases, description of those manifestations.
- **Analysis** – Imaginary disintegration of an upstanding phenomenon in component parts. To highlight the essential elements. Studying of each element as part of the whole.
- **Analysis of schemes/ diagrams** – Selection of required information towards studied topic. Recognition of structures and pathological changes, showed on the scheme/diagram, based on acquired knowledges and selected information. Analysis of functions/role of unknown structures.
- **Comparison** – Analysis of obtained results from a patient with neurological disease and determination of essential features of the disease. Analysis of a second patient with the same disease, but with different particularities of evolution. Comparison on these two patients and highlighting the common features and the differences. To establish the criteria of distinction. Drawing conclusions.
- **Classification** – Identification of structures/processes that need to be classified. Establishing the criteria based on which the classification need to be done. To distribute the structures/processes in groups depending on the criteria settled.
- **Schematic drawing** – Selection of elements that need to be included in scheme. Representation of elements through different symbols/colors and indication of the relation between them. To define an adequate title and the legend of used symbols.
- **Shaping** – Identification and selection of necessary elements for shaping the phenomenon. Imagining (graphic, schematic) of studied phenomenon. Realizing the phenomenon using the developed model. Drawing conclusions, deducted from arguments or statements.

• **Teaching strategies/technologies applied**

"Problem-based learning", "Brainstorming", "Think-pair-show", "Multi-voting", "Round table", "Group interview", "Case study", "Creative controversy", "Focus group technique".

• **Evaluation methods (inclusively with indication of modality of final grade calculation)**

✓ **Current:** frontal control or/and individual through:

- (a) application of multiple-choice tests,
- (b) solving situational problems,
- (c) analyze of clinical cases,
- (d) exam papers,
- (e) essays.

✓ **Final:** verbal examination, multiple choice test and practical skills.

The final grade will consist of the **annual grade** (average of two test-papers (summative assessment: Semiology of the nervous system and Diseases of the nervous system (quota 0,3), patient's bed **practical skills grade** at patient's bed (quota 0,2), **computer tests grade** (quota 0,2) and the **verbal examination grade** which consists in giving response at 4 questions (quota 0.3).

(average of two totalizations (summative assessment: Semiology of the nervous system and diseases of the nervous system) (share 0.3), the grade from the support of practical skills in the patient's bed (share



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0.2) , the final test in the computer system (odds part 0.2) and the mark from the verbal exam with the answer to the ticket consisting of 4 questions (odds part 0.3).

Method of rounding up grades on assessment phase

Chart of intermediary grades (annual grade, examination grades)	National rating system	ECTS Equivalent
1,00-3,00	2	F
3,01-4,99	4	FX
5,00	5	E
5,01-5,50	5,5	
5,51-6,0	6	
6,01-6,50	6,5	D
6,51-7,00	7	
7,01-7,50	7,5	C
7,51-8,00	8	
8,01-8,50	8,5	B
8,51-9,00	9	
9,01-9,50	9,5	A
9,51-10,0	10	

Annual grade and grades from all assessment phases in final examination (computer test, exam-paper, verbal examination) – all will be expressed in numbers in accordance with the scale of evaluation (according to the table), and the final grade will be expressed in two decimal places number, which will be written in student's report card.

Not showing up on exam day without a good reason will be qualified as "absent" and will be equivalent of 0 grade (zero). The student has the right to retake the examination 2 times.

X. RECOMMENDED READING:

A. Mandatory:

1. Harrison's Neurology in Clinical Medicine. Editor: Stephen L. Hauser; Associate Editor: Scott Andrew Josephson. 2010, 765 p. (Electronic version)
2. Harrison's neurology in clinical medicine ed.: S. L. Hauser. - New York, 2013
3. Neurological examination. Made Easy. Editor: Geraint Fuller. 1999, 219 p.

B. Additional:

1. Gherman D. Neurologie și neurochirurgie: manual / D. Gherman, I. Moldovanu, G. Zapuhlâh; Universitatea de Stat de Medicina și Farmacie "Nicolae Testemițanu". – Chișinău: Medicină, 2003. - 528 p.
2. Gavriiliuc M. Teste de autoevaluare și autocontrol la neurologie și neurochirurgie, Chișinău: Medicina, 2008. - 432 p.
3. Gavriiliuc M. Examen neurologic. -Ch. : S. N., 2012 ("Tipografia-Sirius"). -140 p.
4. <http://accessmedicine.mhmedical.com>
5. <http://hinari.usmf.md>
6. <http://www.wipo.int/ardi/en/>
7. <http://accessmedicine.mhmedical.com/>
8. <https://reference.medscape.com/>