

COURSE OUTLINE: PRINCIPLES OF NEUROREHABILITATION

1. GENERAL

SCHOOL	SCHOOL OF HEALTH SCIENCES		
ACADEMIC INIT	PHYSIOTHERAPY		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	PHD5	SEMESTER	4th
COURSE TITLE	PRINCIPLES OF NEUROREHABILITATION		
INDEPENDENT TEACHING ACTIVITIES		WEEKLY TEACHING HOURS	CREDITS
LECTURES		3	4
LABS		-	-
			4
COURSE TYPE	CSM <i>Compulsory Modules of General Knowledge Background (CMGKB), Compulsory Modules of Specific Knowledge Background (CMSKB), Compulsory Specialisation Modules (CSM), Optional Modules (OM)</i>		
PREREQUISITE COURSES:	-		
LANGUAGE OF INSTRUCTION & EXAMINATIONS:	GREEK		
IS THE COURSE OFFED TO ERASMUS STUDENTS?	NO		
COURSE WEBSITE (URL)	https://eclass.uth.gr/courses/PHYSIO_U_148/		

2. LEARNING OUTCOMES

Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described.

Consult Appendix A

- Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area
- Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B
- Guidelines for writing Learning Outcomes

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

1. Analyzes and interprets the physiological and pathological mechanisms underlying postural and movement development and control.
2. Examines the physiological processes of motor learning and functional recovery.
3. Identifies, assesses, and interprets (a) motor deficits (muscle weakness, abnormal muscle tone, coordination impairments), (b) sensory deficits (somatosensory, visual, and vestibular), and (c) cognitive-perceptual deficits (body schema, apraxia, attention, memory, etc.).
4. Interprets the effects of specialized physiotherapeutic techniques and interventions.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations

Project planning and management
Respect for difference and multiculturalism
Respect for the natural environment

<i>Decision-making</i>	<i>Showing social, professional and ethical responsibility</i>
<i>Working independently</i>	<i>and sensitivity to gender issues</i>
<i>Teamwork</i>	<i>Criticism and self-criticism</i>
<i>Working in an international environment</i>	<i>Production of free, creative and inductive thinking</i>
<i>Working in an interdisciplinary environment</i>	<i>Others ...</i>
<i>Production of new research ideas</i>	

<ul style="list-style-type: none"> • Search, analysis, and synthesis of data and information using appropriate technologies. • Decision-making. • Critical thinking and self-reflection. • Independent work. • Adaptation to new situations. • Promotion of new research ideas. • Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues. • Promotion of free, creative, and inductive thinking. • Working in an interdisciplinary environment.
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3. SYLLABUS

Unit 1: Introduction to Neurological Rehabilitation

- Theoretical foundations of physiotherapy in neurological disorders. Historical overview.
- The role of physiotherapists in neurological rehabilitation. Contemporary physiotherapy services. Interdisciplinary approach.
- Basic principles of physiotherapeutic approaches for disorders of the Upper Motor Neuron, Peripheral Motor Neuron (including the motor unit), Extrapyramidal System, and Cerebellum.
- Principles, ethical considerations, scope, and objectives.

Unit 2: Motor Control: Theories and Physiology

- Concept of motor control. Determinants of motor behavior. Theories of motor control (reflex theory, hierarchical theory, systems theory, ecological theory, etc.). Clinical applications and limitations.
- Physiological mechanisms of motor control. Sensory-perceptual and action systems.
- Development of clinical practice and scientific theories: The role of theories in various therapeutic intervention systems.

Unit 3: Motor Learning and Functional Recovery

- Concept of motor learning. Types of learning. Theories of motor learning (Adams' closed-loop theory, Schmidt's schema theory, ecological theory). Clinical applications and limitations. Performance vs. motor learning.
- Theories on motor skill acquisition stages (Fitts & Posner's three-stage model, systematic three-stage model, Gentile's two-stage model). Clinical applications and limitations.
- Functional recovery. Factors influencing recovery (age, experience, etc.).

Unit 4: Neuroplasticity

- Brain plasticity – physiological mechanisms and changes. Plasticity and learning.
- Mechanisms of brain development and neuroplasticity. Stages of nervous system development. Development of brain structures, spinal cord, and nerves.
- Neuroplasticity following brain injury and functional recovery.
- Factors influencing neural network reorganization – mapping.

Unit 5: Postural Control and Movement – Abnormal Postural Control

- Postural control. Basic concepts (center of mass, base of support, center of gravity, stability limits, etc.).
- Postural control systems.
- Mechanisms of upright postural control and bipedal locomotion (gait). Balance control

strategies in standing posture.

- Disorders affecting postural control (coordination deficits, musculoskeletal issues, loss of anticipatory control mechanisms).
- Sensory impairments (loss of sensory inputs).

Unit 6: Muscle Tone and Movement Disorders – Management

- Definition of muscle tone. Neurophysiology of muscle tone. Muscle tone disorders (spasticity, hypotonia, rigidity, dystonia, ataxia, tremor, athetosis, etc.).
- Upper Motor Neuron Syndrome.
- Movement disorders (dyskinesias, dysmetria, tremor, myoclonus, chorea, ataxia, dystonia, etc.).
- Physiotherapeutic interventions for managing spasticity and other muscle tone disorders.
- Decision-making factors in the management of muscle tone disorders.
- Assessment of intervention effectiveness. Muscle tone assessment scales and tests.

Unit 7: Management of Balance Disorders

- Causes and classification of vestibular system disorders.
- Assessment and tests (Hallpike-Dix, Epley's maneuver, etc.).
- Physiotherapeutic management of vestibular disorders. Specialized therapeutic techniques (Frenkel, Cawthorne-Cooksey, etc.). Balance and gait retraining.

Unit 8: Somatosensory and Perceptual-Cognitive Impairments

- Somatosensory impairments (joint position sense, movement sense, tactile recognition deficits). Assessment and management.
- Visual impairments.
- Emotional and cognitive development (memory, perception, language, etc.). Perceptual-cognitive impairments (apraxia, visuoperceptual deficits, spatial agnosia, anosognosia, etc.). Assessment and intervention.

Unit 9: Muscle Strengthening in Neurological Rehabilitation

- Effects of muscle strengthening on muscle power, endurance, and functional capacity.
- Application of strengthening techniques in neurological rehabilitation – correlation with physiotherapeutic intervention systems.

Unit 10: Pain Management in Neurorehabilitation

- Neurophysiology of pain. Chronic pain.
- Pain management (assessment, documentation, intervention strategies). Physiotherapeutic pain management approaches.

Unit 11: Introduction to Specialized Physiotherapeutic Techniques in Neurorehabilitation

- Overview of physiotherapeutic techniques – classification and effects.
- Techniques for facilitating muscle activity, postural control, and movement.
- Methods for controlling muscle tone and maintaining soft tissue properties: passive stretching, taping, loading, positioning, pressure, vibration, cryotherapy, thermotherapy, massage, etc.
- Integration of various techniques within physiotherapeutic intervention systems.

Unit 12: Physiotherapeutic Approaches – Neurorehabilitation Systems

- Overview of physiotherapeutic approaches in neurological rehabilitation – classical and contemporary methods. Evolution of physiotherapy approaches over time.
- Fundamental principles of physiotherapy treatment systems: theoretical background, purpose, and objectives.
- Core principles and theoretical foundations of physiotherapy approaches (treatment systems): PNF, Neurodevelopmental Treatment (NDT), Reflex Locomotion (Vojta), Motor Relearning Program (Carr & Shepherd, Shumway-Cook & Woollacott, etc.), Perfetti, Rood, Constraint-Induced Movement Therapy (CIMT), Feldenkrais, Conductive Education (Peto), etc.

- Combined and selective approach. Integration of different physiotherapy approaches, techniques, and tools.

Unit 13: The Role of Advanced Technology in Neurological Rehabilitation

- Specialized activities and modern technological tools. Training using assistive equipment and robotic systems.
- Interactive devices – motion recognition systems.
- Use of implants for improving postural control, movement, and patient functionality.

Unit 14: Final Student Assessment – Examination.

- Comprehensive assessment of students' performance based on the institution's academic regulations and the course evaluation criteria outlined below.

4. TEACHING and LEARNING METHODS – EVALUATION

<p>DELIVERY</p> <p><i>Face-to-face, Distance learning, etc.</i></p>	<p>Face-to-Face Instruction</p> <p>The teaching methods for the theoretical part of the course include a variety of instructional approaches and tools, such as:</p> <ul style="list-style-type: none"> • Lectures and presentations using a whiteboard, overhead projector, fixed projection system, video, and television. • Classroom discussions and feedback. 																
<p>USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY</p> <p><i>Use of ICT in teaching, laboratory education, communication with students</i></p>	<p>Use of ICT in Teaching, Laboratory Training, and Student Communication</p> <ul style="list-style-type: none"> • Utilization of Information and Communication Technologies (ICT), including the Internet, multimedia, electronic discussions via an asynchronous learning platform, and email. 																
<p>TEACHING METHODS</p> <p><i>The manner and methods of teaching are described in detail.</i></p> <p><i>Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</i></p> <p><i>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS.</i></p>	<table border="1"> <thead> <tr> <th>Activity</th><th>Semester workload</th></tr> </thead> <tbody> <tr> <td>Lectures</td><td>45</td></tr> <tr> <td>Independent Study</td><td>55</td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td></td><td></td></tr> <tr> <td>Couse Total</td><td>100</td></tr> </tbody> </table>	Activity	Semester workload	Lectures	45	Independent Study	55									Couse Total	100
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<p>STUDENT PERFORMANCE EVALUATION</p> <p><i>Description of the evaluation procedure</i></p> <p><i>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</i></p> <p><i>Specifically defined evaluation criteria</i></p>	<p>Student Performance Assessment</p> <p>The assessment criteria for student performance are available on the course website and are specified as follows:</p> <p>Evaluation is conducted either through a final written examination (or an oral examination in the presence of two professors) or in combination with an intermediate assessment (progress test). The final course assessment takes place after the end of the teaching semester and covers the entire syllabus taught. Students are required to answer questions (essay-type or multiple-choice) that evenly cover all course units, as well as questions requiring critical thinking. The final grade for the theoretical part is on a scale of 0-10 and is determined by the</p>																

are given, and if and where they are accessible to students.	<p>final examination or, in the case of an intermediate assessment, by a predetermined weighting coefficient set at the beginning of the semester.</p> <p>Student performance is assessed according to the institution's regulations, based on the combined evaluation of the theoretical and laboratory parts. The weighting factors for each part sum to 1 and depend on the credit allocation of each section. Successful completion of both the theoretical and laboratory parts is a prerequisite for passing the course. The final grade is recorded on a ten-point scale (0-10), with a minimum passing grade of 5.</p>
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5. ATTACHED BIBLIOGRAPHY

<ol style="list-style-type: none"> 1. Βασιλόπουλος Δ. Νευρολογία, Ιατρικές εκδόσεις Πασχαλίδης & Broken hill, 2015. 2. Λογοθέτης, Ι. Μυλωνάς, Ι. Νευρολογία Λογοθέτη, 6^η έκδοση. Εκδόσεις University Studio Press, 2023. 3. Barnes M., Johnson G. Σύνδρομο Ανώτερου Κινητικού Νευρώνα και Σπαστικότητα. Εκδόσεις Παρισιάνου, 2008. 4. Car J., Shepherd R. Νευρολογική Αποκατάσταση. Βελτιστοποίηση των Κινητικών Επιδόσεων. 2^η έκδοση. Εκδόσεις Παρισιάνου; 2013. 5. Lundy-Ekman L. Neuroscience: Fundamentals for rehabilitation. Elsevier; 5th edition, 2018. 6. Martin S., Kessler M. Neurologic interventions for physical therapy. Elsevier; 3rd edition, 2015. 7. Montgomery P., Connolly B. Clinical applications for motor control. Slack incorporated; 2nd edition, 2002. 8. Schmidt R. Motor control and learning – A behavioral emphasis. 6th edition. Human Kinetics Publisher, 2018. 9. Shumway-Cook A., Woollacott M. Κινητικός Έλεγχος. Από την Έρευνα στην Κλινική Πράξη. 3^η έκδοση. Εκδόσεις Π. Χ. Πασχαλίδης. 2012. 10. Stokes M., Stack E. Κλινική διαχείριση για νευρολογικές καταστάσεις. 3^η έκδοση. Επιστημονικές εκδόσεις Παρισιάνου. 2016. 11. Umphred D. A. Neurological Rehabilitation. 6th edition. Elsevier - Mosby 2012.
