COURSE UNIT DESCRIPTION

Course unit title	Code
Conducting rehabilitation research	

Annotation

Lecturer(s)	Department, Faculty
Coordinating: prof. Dr. N. Masiulis **Other:**	Department of Rehabilitation, Physical and Sports Medicine, Institute of Health Science, Faculty of Medicine, Vilnius University, M. K. Čiurlionio Str. 21, LT-03101 Vilnius, Lithuania

Study cycle	Type of the course unit
Second	Mandatory

Mode of delivery	Semester or period when it is delivered	Language of instruction
In classroom/on line	2 semester	English

Requisites	
Prerequisites: n/a	**Co-requisites (if relevant):** n/a

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	113	48	69

Purpose of the course unit: programme competences to be developed			
The aim of the course is to provide students with knowledge and skills to use modern methodologies to: a) use modern methodologies to assess changes in the brain, skeletal muscle, central nervous system, cardiovascular system and blood biochemistry during rehabilitation research; (b) planning rehabilitation studies to test scientific hypotheses; (c) to collect research data, interpret research results and draw scientific conclusions; (d) to produce high-level scientific publications.			
Expected learning outcomes	**Learning outcomes of the course unit**	**Teaching and learning methods**	**Assessment methods**
Knowledge and its application A2	Knows and applies methods of analysis and dissemination of research data in solving complex rehabilitation problems.	Lecture (basic information, analysis of examples, discussion) Literature analysis Seminars (discussion of independent tasks) Exercises: problem solving	Assessment of independent tasks Exam (see criteria below)
Ability to conduct research B1, B2, B3	Ability to systematize research data, prepare it for dissemination. Ability to analyse the results by evaluating the effectiveness of rehabilitation and the conditions of application of its specific methods.		

	Able to draw conclusions about the application of research findings to an individual patient problem.		
Personal skills E1, E2	Ability to reflect on study achievements and anticipate one's professional development perspective. Ability to understand the importance of research in improving professional performance and decision-making to improve the quality of life of patients.		
Special abilities C1	Ability to conduct research and apply basic modern rehabilitation research methods according to individual rehabilitation needs.	Case study (critical evaluation of a rehabilitation study) and modelling of a comprehensive rehabilitation program.	Analysis and discussion of scientific articles formative evaluation.
Social skills D1	Ability to convey generalized information on rehabilitation efficiency to a specialist and non-specialist audience and target group in a reasoned and purposeful way using graphic means.	Independent assignments (written form).	Evaluation by criteria: -graphic representation of results; -consistency in the description of the results obtained.

Course content: breakdown of the topics	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship/work	Contact hours,	Individual work	Assignments
1.Research-based rehabilitation. Critical evaluation of a rehabilitation study (CAT method). Ethics of biological research.	1		4				5		Scientific articles in this field critical reading, analysis, and presentation in PowerPoint. Analysis and presentation of research methods in PowerPoint. Preparation for the seminar, completion of seminar tasks.
2. Research methods of structural and functional changes in the brain (NAA, Glx, Cho, myo-inositol). Effects of ageing and neurodegenerative diseases on the brain.	1		4				5	34	
3. Application of modern central nervous system and skeletal muscle examination methodologies (MRI, fMRI, MRS, TMS, PET, EEG, TMG, BFR, etc.) in rehabilitation studies.	1		4				5		
4. Adaptation of skeletal muscle, tendon and bone during different rehabilitation interventions.	1		4				5		
5. Physical inactivity, immobilization, muscle atrophy, adipose tissue (IMAT) studies.	1		4				5		
6. Biochemical (myokins and exerkines) and hormonal changes during different rehabilitation interventions (IL-6, IL-10, IGF-1, CK, Ia, BDNF, CAF, PGC1α-kynurenine, CRB, TNF-α, etc.).	1		4				5	6	Study of studying and scientific literature. Preparing for the seminar. Completion of seminar tasks and preparation of written work.
7. Changes in balance during different rehabilitation interventions (dual task, entropy). Brain-muscle interaction studies.	1		2				4	6	
8. Central (CNS) and peripheral (mechanisms of muscle damage) fatigue and other aspects	1		2				4	6	Study of studying and scientific literature.

Topic									Independent work
(temperature, circadian rhythm, etc.) that may affect the research results.									Preparing for the seminar. Completion of seminar tasks and preparation of written work.
9. Conducting research in the elderly: interactions between motor and cognitive functions (sarcopenia, RFD, MOCA, mild cognitive impairment, functional status assessment tests, Purdue pegboard test, etc.).	1		2				4	8	Study of studying and scientific literature. Preparing for the seminar. Completion of seminar tasks and preparation of written work.
10. Preparation of scientific articles: from hypothesis to publication (Candy model). Preparation and presentation of a scientific report.	1		4				6	9	Study of scientific literature. Completion of practical tasks in a computer class. Preparing for the seminar. Completion of seminar tasks and preparation of written work.
Total	**10**	**0**	**34**				**48**	**69**	

Assessment strategy	Weight %	Deadline	Assessment criteria
Introduction to the CAT method (X)	20	During the semester	Areas of presentation of the task and presentation to be assessed: • Topic Disclosure: 3 points. • Teaching logic: 2 points. • Scientific sources: 2 points. • Scientific discussion: 3 points.
Written survey (Y)	30	During the semester	The written survey consists of 5 open-ended questions. Excellent knowledge (10 points) 95-100 percent correct answers; Very good knowledge and skills (9 points) 85-94 percent correct answers. Better than average knowledge (8 points) 75-84 percent correct answers; Average knowledge and skills (7 points) 65-74 percent correct answers; Knowledge and skills are worse than average (6 points) 55-64 percent correct answers; Knowledge and skills meet the minimum requirements (5 points) 51-54 percent correct answers; Minimum requirements are not met (4 points) 39-50 percent correct answers; Minimum requirements are not met (3 points) 26-38 percent correct answers; Bad news (2 points) 13-25 percent correct answers; Very bad knowledge (1 point) 1-12 percent correct answers.
Exam (Z)	50	During the semester	The written survey consists of 5 open-ended questions. Excellent knowledge (10 points) 95-100 percent correct answers; Very good knowledge and skills (9 points) 85-94 percent correct answers. Better than average knowledge (8 points) 75-84 percent correct answers; Average knowledge and skills (7 points) 65-74 percent correct answers; Knowledge and skills are worse than average (6 points) 55-64 percent correct answers; Knowledge and skills meet the minimum requirements (5 points) 51-54 percent correct answers;

		Minimum requirements are not met (4 points) 39-50 percent correct answers; Minimum requirements are not met (3 points) 26-38 percent correct answers; Bad news (2 points) 13-25 percent correct answers; Very bad knowledge (1 point) 1-12 percent correct answers.		

Cumulative assessment grade on a 10-point scale: A = 0.20 * X + 0.30 * Y + 0.5 * Z

Author	Publishing year	Title	Issue of a periodical or volume of a publication; pages	Publishing house or internet site
Required reading				
Law, M. C., & MacDermid, J. (Eds.).	2008	Evidence-based rehabilitation: A guide to practice.		Slack Incorporated.
Wade DT.	2020	What is rehabilitation? An empirical investigation leading to an evidence-based description.	34(5):571-583. doi:10.1177/026921552 0905112	Clinical Rehabilitation.
Marcus RL, Addison O, Kidde JP, Dibble LE, Lastayo PC.	2010	Skeletal muscle fat infiltration: impact of age, inactivity, and exercise.	14(5):362-6. doi: 10.1007/s12603-010-0081-2. PMID: 20424803; PMCID: PMC3758242.	The Journal of Nutrition, Health and Aging
Mark E. Ladd, Peter Bachert, Martin Meyerspeer et al.,	2018	Pros and cons of ultra-high-field MRI/MRS for human application	109, 1-50.	Progress in Nuclear Magnetic Resonance Spectroscopy,
Voelcker-Rehage, Claudia, Niemann, Claudia	2013	Structural and functional brain changes related to different types of physical activity across the lifespan	37, 2268–2295.	Neuroscience and Biobehavioral Reviews
Baguet A, Everaert I, Hespel P, Petrovic M, Achten E, Derave W	2011	A new method for non-invasive estimation of human muscle fiber type composition	6(7):e21956. doi: 10.1371/journal.pone.00 21956. Epub 2011 Jul 7. PMID: 21760934.	PLoS One
Westcott, Wayne L.	2012	Resistance training is medicine: effects of strength training on health.	11(4):209-216.	Current Sports Medicine Reports
Sumit Kumar	2020	Biochemistry of the Brain. In Examining Biological Foundations of Human Behaviour	(pp. 47-59).	IGI Global
Lambert, B. S., Hedt, C., Moreno, M., Harris, J. D., & McCulloch, P.	2018	Blood flow restriction therapy for stimulating skeletal muscle growth: practical considerations for maximizing recovery in clinical rehabilitation settings.	33(2), 89-97.	Techniques in Orthopaedics
Wei, L., Chai, Q., Chen, J., Wang, Q., Bao, Y., Xu, W., & Ma, E.	2020	The impact of Tai Chi on cognitive rehabilitation of elder	1-10.	Disability and Rehabilitation

		adults with mild cognitive impairment: a systematic review and meta-analysis.		
Al Saedi, A., Duque, G., & Stupka, N.	2021	Targeting intramuscular adipose tissue expansion to preserve contractile function in volumetric muscle loss: A potentially novel therapy?	58, 21-26.	Current Opinion in Pharmacology
Recommended reading				
Wouter A.J. Vints, Oron Levin, Hakuei Fujiyama, Jeanine Verbunt, Nerijus Masiulis	2022	Exerkines and long-term synaptic potentiation: mechanisms of exercise-induced neuroplasticity.	.	Accenpted: Frontiers in Neuroendocrinology
Behzadi, P., & Gajdács, M	2021	Writing a strong scientific paper in medicine and the biomedical sciences: a checklist and recommendations for early career researchers.	72(4), 395-407.	Biologia Futura