LITHUANIAN SPORTS UNIVERSITY

STUDY MODULE PROGRAMME (SMP)

Module Code	B	710	M	011	Accredited until				Renewal date		
	Branch of Science		Progr.	Registr. №.							

Entitlement

Telerehabilitation, Robotics and Virtual Reality

Prerequisites

Physiology, Biomechanics, Motor control and learning, Neurorehabilitation

Course (module) Learning Outcomes

№.	Learning Outcomes	Teaching / Learning Methods	Assessment Methods
1	Gain knowledge about the use of innovative technologies in neurorabilitation	Discussion, Exercise classes, Formal lecture, Laboratory classes, Practical exercises (tasks), Scientific paper analysis, Seminar	Control work, Reporting for practice work, Scientific paper (text) analysis
2	Understand the effective principles of neurorabilitation based on modern science	Discussion, Formal lecture, Scientific paper analysis, Seminar	Control work, Scientific paper (text) analysis
3	Be able to creatively apply innovative technologies in practice	Case analysis (Case study), Exercise classes, Formal lecture, Group work, Laboratory classes, Practical exercises (tasks), Role play, Scientific paper analysis, Seminar	Reporting for practice work

Main aim

The aim of this module is to introduce students to the forms of telerehabilitation services, innovative technologies, and perspectives of their application in neurorehabilitation. Based on achievements in modern fundamental and applied sciences, students are provided with the knowledge and ability to creatively apply and work with modern technologies.

Summary

The concept of telemedicine, and opportunities in application of telerehabilitation and various modern technologies such as robotics, virtual reality, transcranial magnetic stimulation and transcranial direct current stimulation in neurorehabilitation.

Level of module

Level of programme		Subject group (under the regulation of the area)	Subject level
Cycle	Type		
Second	Master	Specialaus lavinimo	Deepening

Group under financial classification

Syllabus

№.	Sections and themes	Responsible lecturer
1.	Telemedicine	
2.	Telerehabilitation	
3.	Neuroplasticity-based rehabilitation	
4.	Rehabilitation robotics	
5.	Application of Transcranial magnetic stimulation in neurorehabilitation	
6.	Application of Transcranial direct current stimulation in neurorehabilitation	
7.	Virtual reality in neurorehabilitation	
8.	Use of active video games in neurorehabilitation	

Evaluation procedure of knowledge and abilities:

References

№.	Title	Edition in Lithuanian Sports University library		In Lithuanian Sports University bookstore	Number of ex. in the methodical cabinet of the depart.
		Pressmark	Number of exemplars		
1.	Cameron JD, Ramaprasad A, Syn T. An ontology of and roadmap for mHealth research. Int J Med Inform. 2017;100:16-25.			No	
2.	Shaffer J. Neuroplasticity and clinical practice: building brain power for health. Front Psychol. 2016;7:1118.			No	
3.	Khalid S, Alnajjar F, Gochoo M, Shimoda S. Robotic assistive and rehabilitation devices leading to motor recovery in upper limb: a systematic review. Disabil Rehabil Assist Technol. 2021:1-15.			No	
4.	Tang A, Thickbroom G, Rodger J. Repetitive transcranial magnetic stimulation of the brain: mechanisms from animal and experimental models. Neuroscientist. 2017;23(1):82-94.			No	
5.	Lefaucheur JP, Antal A, Ayache SS, Benninger DH, Brunelin J, Cogiamanian F, Cotelli M, et al. Evidence-based guidelines on the therapeutic use of transcranial direct current stimulation (tDCS). Clin Neurophysiol. 2017;128(1):56-92.			No	
6.	Aminov A, Rogers JM, Middleton S, Caeyenberghs K, Wilson PH. What do randomized controlled trials say about virtual rehabilitation in stroke? A systematic literature review and meta-analysis of upper-limb and cognitive outcomes. J Neuroeng Rehabil. 2018;15(1):29.			No	
7.	Cano Porras D, Siemonsma P, Inzelberg R, Zeilig G, Plotnik M. Advantages of virtual reality in the rehabilitation of balance and gait: Systematic review. Neurology. 2018;90(22):1017-1025.			No	
8.	Mat Rosly M, Mat Rosly H, Davis Oam GM, Husain R, Hasnan N. Exergaming for individuals with neurological disability: a systematic review. Disabil Rehabil. 2017;39(8):727-773.			No	

Additional literature

№.	Title
1.	Brophy PD. Overview on the challenges and benefits of using telehealth tools in a pediatric population. Adv Chronic Kidney Dis. 2017;24(1):17-21. \
2.	Dobkin BH. A rehabilitation-internet-of-things in the home to augment motor skills and exercise training. Neurorehabil Neural Repair. 2017;31(3):217-227.
3.	Cramer SC, Sur M, Dobkin BH, O'Brien C, Sanger TD, Trojanowski JQ, et al. Harnessing neuroplasticity for clinical applications. Brain. 2011;134(Pt 6):1591-609.
4.	Kolb B, Muhammad A. Harnessing the power of neuroplasticity for intervention. Front Hum Neurosci. 2014;8:377.
5.	Huang VS, Krakauer JW. Robotic neurorehabilitation: a computational motor learning perspective. J Neuroeng Rehabil. 2009;6:5.
6.	Donati AR, Shokur S, Morya E, Campos DS, Moioli RC, Gitti CM, et al. Long-term training with a brain-machine interface-based gait protocol induces partial neurological recovery in paraplegic patients. Scientific Reports, 6, 30383.
7.	Alia C, Spalletti C, Lai S, Panarese A, Lamola G, Bertolucci F, et al. Neuroplastic changes following brain ischemia and their contribution to stroke recovery: novel approaches in neurorehabilitation. Front Cell Neurosci. 2017;11:76.

№.	Title
8.	Morone G, Paolucci S, Cherubini A, De Angelis D, Venturiero V, Coiro P, Iosa M. Robot-assisted gait training for stroke patients: current state of the art and perspectives of robotics. Neuropsychiatr Dis Treat. 2017;13:1303-1311.
9.	Kang N, Summers JJ, Cauraugh JH. Non-invasive brain stimulation improves paretic limb force production: a systematic review and meta-analysis. Brain Stimul. 2016;9(5):662-670.
10.	Garcia-Agundez A, Folkerts AK, Konrad R, Caserman P, Tregel T, Goosses M, Göbel S, Kalbe E. Recent advances in rehabilitation for Parkinson's Disease with exergames: A systematic review. J Neuroeng Rehabil. 2019;16(1):17.

Coordinating lecturer

Position	Degree, surname, name	Schedule №.
Associate Professor		897

Subdivision

Entitlement	Code
Department of Health Promotion and Rehabilitation	2006

Study module teaching form №. 1

Semester		Mode of studies	Structure				Total hours	Credits
			Theory	Seminars	Lab Works	Ind. work		
A	S	D	9	5	16	230	260	10

Languages of instruction:

Lithuanian	L	English	E	Russian	R	French	F	German	G	Other	Oth.

Plan of in-class hours

№. of Themes	Academic hours			№. of Themes	Academic hours		
	Theory	Seminars	Lab Works		Theory	Seminars	Lab Works
1.	1	0	0	5.	1	0	1
2.	1	0	1	6.	1	0	0
3.	1	0	0	7.	1	0	0
4.	2	2	14	8.	1	3	0
				Total:	9	5	16

Schedule of individual work tasks and their influence on final grade

	№. of syllabus	Total hours	Influence on grade, %	Week of presentment of task (*) and reporting (o)															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17-20
Accounting for practice sessions	4	40	20			*							0							
Accounting for practice sessions	4	50	20			*									0					
Scientific paper (text) analysis	4, 7, 8	50	20			*												0		
Colloquium	1-8	90	40			*													0	
Total:	-	230	100																	

Study module teaching form №. 2

Semester		Mode of studies	Structure				Total hours	Credits
			Theory	Seminars	Lab Works	Ind. work		
A	S	N	9	5	16	230	260	10

Languages of instruction:

Lithuanian	L	English	E	Russian	R	French	F	German	G	Other	Oth.

Plan of in-class hours

№. of Themes	Academic hours			№. of Themes	Academic hours		
	Theory	Seminars	Lab Works		Theory	Seminars	Lab Works
1.	1	0	0	5.	1	0	1
2.	1	0	1	6.	1	0	0
3.	1	0	0	7.	1	0	0
4.	2	2	14	8.	1	3	0
				Total:	9	5	16

Schedule of individual work tasks and their influence on final grade

	№. of syllabus	Total hours	Influence on grade, %	Week of presentment of task (*) and reporting (o)															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17-20
Accounting for practice sessions	4	40	20							*	0									
Accounting for practice sessions	4	50	20							*								0		
Colloquium	1-8	90	40							*									0	
Scientific paper (text) analysis	4, 7, 8	50	20							*									0	
Total:	-	230	100																	