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DESCRIPTION/Syllabi of Curricula/Module

Short Name of the University/Country code	PSTU Ukraine
Date (Month / Year)	June 2021
TITLE OF THE MODULE	Code
Biomedical signal processing	

Teacher(s)	Department
Coordinating: Assoc. Prof. Oleksiy Koyfman, PhD Others:	Department of Automation and Computer-Integrated Technologies

Study cycle (BA/MA)	Level of the module (Semester number)	Type of the module (compulsary/elective)
MA	Any semester for Masters	Elective

Form of delivery (theory/lab/exercises)	Duration (weeks/months)	Language(s)
Lectures, Seminary	16 weeks	Ukrainian/English

Prerequisites	
Prerequisites: Knowledge: Basic knowledge of physics chemistry, biology, linear algebra Skills: ability to search information in the Internet. Competences: none	Co-requisites (if necessary): Students should have skills to work in basic computer software

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
6	210	36	174
Aim of the module (course unit): competences foreseen by the study programme			
Students should be able to: - analyze the work of analog and digital devices for processing biomedical signals - simulate the work of signal processing devices			
Learning outcomes of module (course unit)	Teaching/learning methods (theory, lab, exercises)	Assessment methods (written exam, oral exam, reports)	
Knowledge: Knowledge of basic algorithms for signal processing Knowledge of characteristics and operation principle of modern analog and digital signal processing devices Knowledge of data used in biomedical equipment	Work with the lecture notes as well as on the available fundamental subject literature	Knowledge test	
Skills: Ability to use standard terminology, definitions, designations and units used in biomedical signal and data processing techniques. Skills connected with visualizing the obtained results with a simple user interface.	Lectures, project, consultation	Active attendance on lectures, individual/group project and presentation	
Competences: Study the subject literature, exchange knowledge, working in group	Lectures, project, consultation	Individual/group project and presentation	

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
1. Introduction to Biomedical Signal Processing	2			2			4	24	Study popular approaches in signal processing included in compulsory literature
2. Methods of analysis of deterministic signals	3			3			6	25	Correlation analysis of deterministic signals. Mutual correlation function of biomedical signals
3. Methods of analysis of random biomedical signals	3			3			6	25	Two-dimensional probability density and the energy spectrum of a random process.
4. Methods of analog filtration of biomedical signals	3			3			6	26	Hilbert transforms, related functions, their basic properties.
5. Digital filtering of biomedical signals	2			2			4	24	Application of digital filtering in numerical solution of approximation and smoothing problems
6. Methods of biomedical information analysis	2			2			4	24	Electrophysiological parameters of the organism and their corresponding signals
7. Imaging and pattern recognition systems in medicine	3			3			6	26	Principles of building information display systems
Total	18			18			36	174	

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Individual or group final project referred during seminars	20	3 th -14 th week	Project
Final exam	80		Test

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printinghouse or internet link
Compulsory literature				
L.Tan, J.Jiang	2019	Digital Signal Processing: Fundamentals and Applications. 3 ed.		Academic Press. – 920 p.
E. Kaniusas	2019	Biomedical Signals and Sensors III: Linking electric biosignals and biomedical sensors		Springer. – 550 p.
A. Subasi	2019	Practical guide for biomedical signals analysis using machine learning techniques: A MATLAB based approach		Academic Press. – 456 p.
W. Van Drongelen	2018	Signal processing for neuroscientists: an introduction to the analysis of physiological signals		Academic press. – 320 p.
Additional literature				
D. Fitzpatrick	2020	Biomedical Signal Processing and Artificial Intelligence in Healthcare		Academic Press, Elsevier. – 268 p.
J. Semmlow	2019	Circuits, Signals and Systems for Bioengineers: A MATLAB-Based Introduction		Academic Press, Elsevier. – 755 p.
S.D. Cano-Ortiz, R.Langmann, Y.Martinez-Cañete, L.Lombardia-Legra, F.Herrero-Betancourt, H.Jacques	2018	A Web-Based Tool for Biomedical Signal Management. In: Auer M., Zutin D. (eds) Online Engineering & Internet of Things	vol. 22	Lecture Notes in Networks and Systems -Springer, Cham.
J.Kubicek, M.Penhaker, O.Krejcar, A.Selamat	2021	Modern Trends and Applications of Intelligent Methods in Biomedical Signal and Image Processing	vol. 21(3)	Sensors, p. 847