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DESCRIPTION OF THE COURSE SYLLABI

NU ZAPORIZHZHIA POLYTECHNIC, UA	
TITLE OF THE COURSE	Code
Embedded biomedical systems and wireless sensor networks	ПІІІН03

Teacher(s)	Department
Coordinating: Anzhelika Parkhomenko Others: Olga Gladkova	Software Tools Radio Engineering and Telecommunications

Study cycle	Level of the curricula	Type of the curricula
MA	2	normative

Form of delivery	Duration	Language(s)
Lectures/lab	15 weeks	Ukr/Eng

Prerequisites	
Prerequisites: Information technologies	Co-requisites (if necessary): - Biomedical signals, signal processing - Machine learning and artificial intelligence - Virtual and augmented reality in biomedical applications

ECTS	Total student workload hours	Contact hours	Individual work hours
6,0	180	60	120

Aim of the course: competences foreseen by the study programme		
Research, development and application of embedded biomedical systems and wireless sensor networks for the monitoring of biomedical signals and telemedicine data.		
Learning outcomes of the course	Teaching/learning methods	Assessment methods
Students will gain general competencies defined in the Educational Professional Program	Lectures, preparation for laboratory classes, laboratory work, students self-study under the guidance of a teacher.	Separate assessment does not apply
Students will gain special competencies defined in the Professional Education Program	Lectures and consultations. Students self-study under the guidance of a teacher, preparation and execution of laboratory works.	Reports on laboratory and self-study
Students will be able to develop software and hardware for embedded biomedical systems and telemedicine.	Lectures and consultations. Students self-study under the guidance of a teacher, preparation and execution of laboratory works.	Reports on laboratory and self-study



Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultation	Seminars	Practical work	Laboratory work	Course project	Total contact work	Individual work	Tasks
Module 1. Embedded systems (ES) for biomedical application	14				10		24	21	
1.1 Classification and features of modern ES	4						4	1	Analysis of literature sources
1.2 Methods of ES development. Remote engineering technologies for ES prototyping.	4						4	2	Analysis of literature sources
1.3 Modern hardware/software platforms for ES prototyping. Shields for extra functionality. Sensors for biomedical application.	6				10		16	18	Preparation for laboratory work №1-2. Self-study works №1-6 (Part 1), 1-6 (Part 2)
Module 2. Wireless techniques for data transmission and collecting	6				14		20	25	
2.1 Classification of wireless technologies. Features of Wi-Fi, Bluetooth, GSM, GPRS, Xbee technologies.	2						2	7	Analysis of literature sources
2.2 Implementation of wireless technologies based on specialized modules. Mesh network.	2				10		12	10	Preparation for laboratory work №4-5.
2.3 Cloud services for collecting and storing telemedicine data.	2				4		6	8	Preparation for laboratory work №3.
Module 3. Development and application of control systems for users with special needs.	10				6		16	29	
3.1 Principles of new realities creation for users with special needs	6						10	10	Analysis of literature sources
3.2 Hardware/software complex based on virtual reality headsets, motion and voice alerts controllers.	4				6		10	19	Reading literature and preparation for laboratory work №6.
Module 4. Course project. Development and research of prototypes of biomedical and telemedicine systems.						45			Research and practical implementation of the project on the selected topic.
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Assessment strategy	Weight in %	Deadlines	Assessment criteria
Final test	20	10	Grade A (excellent) – clarity of expression – excellent, confident delivery, practical tasks – full done. Grade B (good) – clarity of expression – good, thoughts and ideas clearly expressed, practical tasks – well done. Grade C (good) – clarity of expression – well-placed, delivery is fluctuating, practical tasks - well done. Grade D (passed) – clarity of expression – poor, delivery is fluctuating, practical tasks done with mistakes. Grade E (fail) – failure in theoretical or practical tasks.
Lab and self-study works assessments	80	50	All labs and self-study reports should be passed
Course project assessment	100	60	Defense of the course project should be successful

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
A. V. Parkhomenko, A.V. Tulenkov, O. M. Gladkova, Ya. I. Zalyubovskiy,	2021	Embedded biomedical systems and wireless sensor networks		Zhytomyr, PE "Euro-Volyn"
A. V. Parkhomenko, O. M. Gladkova, Ya. I. Zalyubovskiy, A. V. Parkhomenko	2017	Engineering of Embedded Systems		Zaporizhzhia, Dyke pole http://eir.zntu.edu.ua/handle/123456789/1969
A. V. Parkhomenko, G. V. Tabunshchuk, M. O. Poliakov, O. M. Gladkova, T. I. Kaplienko, T. Y. Larionova	2016	Remote and virtual tools in engineering		Zaporizhzhia, Dyke pole /http://eir.zntu.edu.ua/handle/123456789/1825
Additional literature				
E. Krogh	2020	An Introduction to the Internet of Things		bookboon.com/en
McEwen, H. Cassimally	2014	Designing the Internet of Things		Wiley