Report on Quality Assessment
(2020– 2021)

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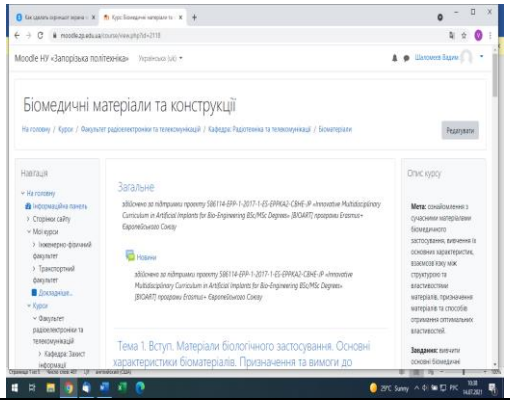
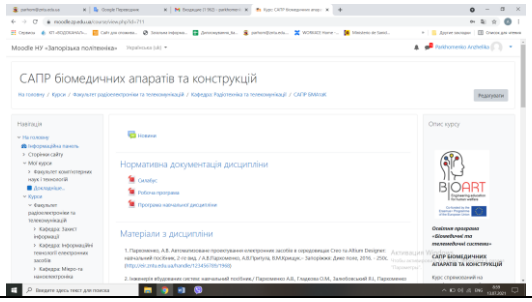
1 Results of curriculum evaluation

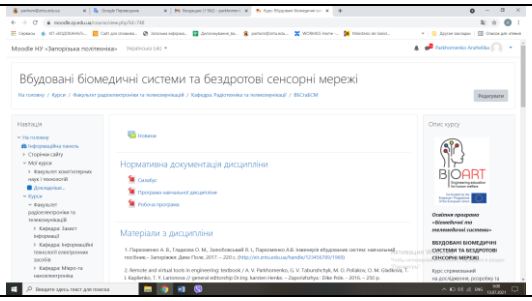
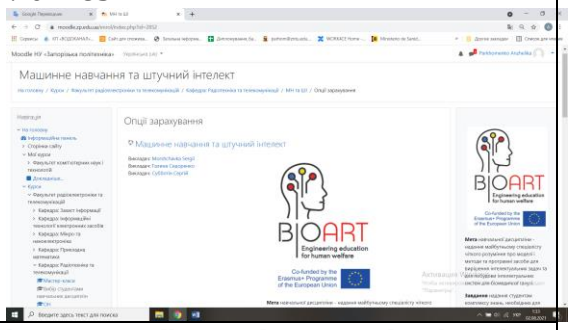
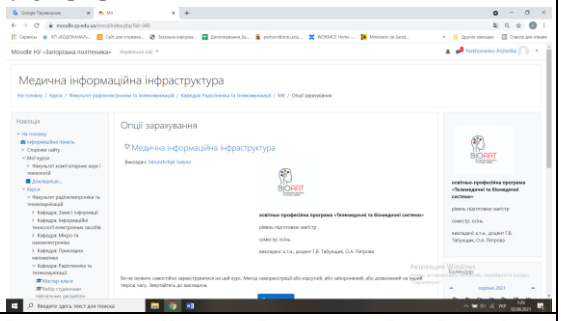
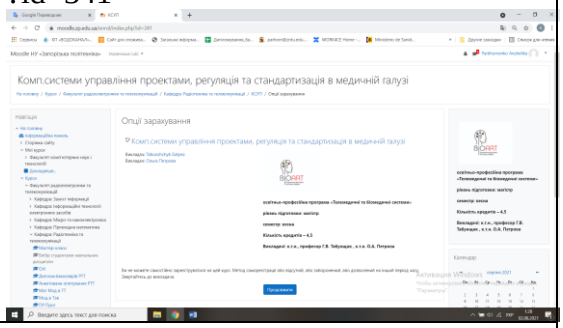
The new interdisciplinary curriculum "Telemedicine and biomedical systems" (https://zp.edu.ua/sites/default/files/konf/opp_biomed.pdf) (for 2nd level – Master) was opened at the Department of Radio Engineering and Telecommunications of National University Zaporizhzhia Polytechnic (https://zp.edu.ua/kafedra-radiotehniki-ta-telekomunikaciy) and successfully accredited at the state level by the National Agency for Quality Assurance in Higher Education (Ukraine) in the fall semester of 2020 year (https://zp.edu.ua/sites/default/files/konf/zvit_pro_samoocinyuvannya_opp_biomed.pdf).

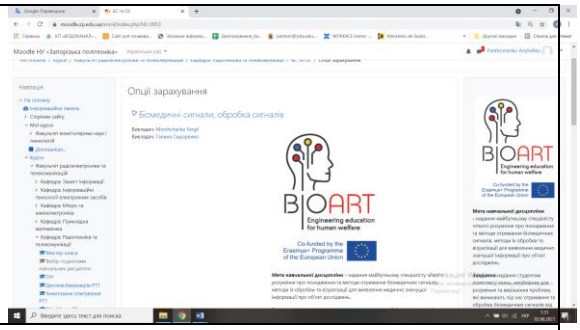
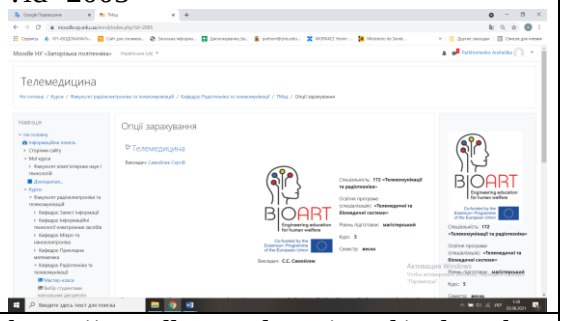
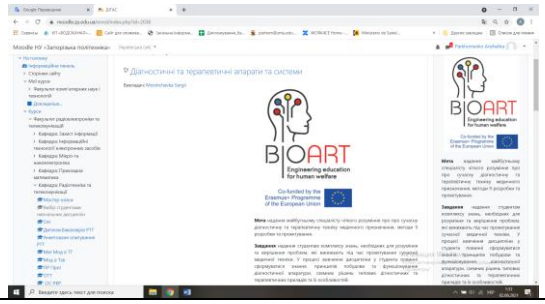
The plan for developed curriculum (https://zp.edu.ua/sites/default/files/konf/navchalnyy_plan_biomed_2019_2020.pdf) contains a set of disciplines (https://zp.edu.ua/?q=node/327) for which all educational and methodological support documents are provided and presented in the University Learning Management System Moodle (https://moodle.zp.edu.ua/). The results of the development of curricula and disciplines are also available on the BIOART project website (https://zp.edu.ua/?q=node/6985).

Lecturers from three departments (Software Tools, Radio Engineering and Telecommunications, Physical Materials Science) took part in the development of a new curriculum "Telemedicine and biomedical systems". The project team has developed and successfully tested ten academic disciplines:

1.1 Using e-learning environment

N	Module	Responsible person (First and last name, faculty, department, affiliation, e-mail)	Link in LMS Moodle, screenshots
1	Biomedical materials and structures	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science, shalomeev@radiocom.net.ua	https://moodle.zp.edu.ua/course/view.php?id=2118 
2	CAD of biomedical devices and structures	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department, PhD, Associate professor, parhom@zntu.edu.ua	https://moodle.zp.edu.ua/course/view.php?id=711 
3	Embedded biomedical systems and wireless sensor	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software	https://moodle.zp.edu.ua/course/view.php?id=748

	networks	Tools Department, PhD, Associate professor, parhom@zntu.edu.ua	
4	Machine learning and artificial intelligence	Sergey Subbotin, Faculty of Computer Science and Technology, Head of Software Tools Department, Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Head of Radio Engineering and Telecommunications Department	https://moodle.zp.edu.ua/enrol/index.php?id=2852 
5	Medical information infrastructure	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	https://moodle.zp.edu.ua/enrol/index.php?id=345 
6	Computer project management systems, regulation and standardization in the medical field	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	https://moodle.zp.edu.ua/enrol/index.php?id=341 
7	Microwave and quantum technologies in medicine	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Department of Radio Engineering and Telecommunications Head of Radio Engineering and Telecommunications Department	No presented
8	Biomedical signals, signal processing	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications,	https://moodle.zp.edu.ua/enrol/index.php?id=2853

		Department of Radio Engineering and Telecommunications Head of Radio Engineering and Telecommunications Department	
9	Telemedicine	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Department of Radio Engineering and Telecommunications Head of Radio Engineering and Telecommunications Department	https://moodle.zp.edu.ua/enrol/index.php?id=2005 
10	Diagnostic and therapeutic devices and systems	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Department of Radio Engineering and Telecommunications Head of Radio Engineering and Telecommunications Department	https://moodle.zp.edu.ua/enrol/index.php?id=2038 

1.2 Indicators of curriculum evaluation

As a result, theoretical and practical components have been developed for these disciplines, in particular, 59 new laboratory works using the equipment purchased with the funds of the BIOART project (https://zp.edu.ua/nove-obladnannya-dlya-osnashchennya-laboratoriy).

8 textbooks have been published for the effective study of the disciplines of the curriculum They are «Prototyping of biomedical devices and structures»; «Automated design of electronic devices in Creo and ALTIUM DESIGNER environments»; «Embedded biomedical systems and wireless sensor networks»; «Materials science of medical devices»; «Neural networks: theory and practice»; «Design of information infrastructure of medical and telemedicine systems»; «Millimeter waves and their application in medicine»; «Design of surface elements in mechanical engineering».

In the future, it is necessary to present developed teaching materials on the discipline Microwave and quantum technologies in medicine in the LMS Moodle; as well as to prepare textbooks on the disciplines Microwave and quantum technologies in medicine, Telemedicine, Diagnostic and therapeutic devices and systems.

For the joint BIOART book "Teaching and subjects on bio-medical engineering", the team prepared six chapters, some of which were developed in cooperation with European and Ukrainian colleagues. This book is used for 5 disciplines of new curriculum.

Thus, the new curriculum has been developed, provided with teaching materials and personnel, successfully implemented and accredited.

N	Module	Responsible person	Number of ECTS	Number of developed lab/practical works	Title of chapter in BIOART book «Teaching and subjects on bio-medical engineering»	Title of developed textbook
1	CAD of biomedical devices and structures	Anzhelika Pakhomenko	5	7	The Use of Information Technology in the Designing and Manufacture of Implants	Prototyping of biomedical devices and structures; Automated design of electronic devices in Creo and ALTIUM DESIGNER environments
2	Embedded biomedical systems and wireless sensor networks	Anzhelika Pakhomenko	6	6	Modern Technologies for Biomedical Systems Prototyping	Embedded biomedical systems and wireless sensor networks
3	Biomedical materials and structures	Vadim Shalomeev	5	9	New biodegradable magnesium based alloy for osteosynthesis	Materials science of medical devices
4	Machine learning and artificial intelligence	Sergey Subbotin, Sergey Morshchavka	5	4	The Data Dimensionality Reduction for Biomedical Applications	Neural networks: theory and practice
5	Medical information infrastructure	Galyna Tabunshchyk	5,5	6	Architectural Characteristics of Biomedical Software Applications	Design of information infrastructure of medical and telemedicine systems
6	Computer project management systems, regulation and standardization in the medical field	Galyna Tabunshchyk	4,5	6	-	Design of information infrastructure of medical and telemedicine systems
7	Microwave and quantum technologies in medicine	Sergey Morshchavka	3	4	-	-
8	Biomedical signals, signal processing	Sergey Morshchavka	5	7	-	Millimeter waves and their application in medicine

9	Telemedicine	Sergey Morshchavka	3	4	-	-
10	Diagnostic and therapeutic devices and systems	Sergey Morshchavka	5,5	6	-	-

2 Results of Pilot teaching evaluation

2.1 Number of students participating in pilot teaching + supporting documents

In the 2020-2021 academic year, 2 students of the Department of Radio Engineering and Telecommunications, who are studying according to the new program "Telemedicine and biomedical systems", passed pilot teaching. In fall semester, they successfully studied the following disciplines: Embedded biomedical systems and wireless sensor networks, Medical information infrastructure. In spring semester, they successfully studied the following disciplines: Computer project management systems, regulation and standardization in the medical field, CAD of biomedical devices and structures.

New developed teaching materials were also introduced into the training of students in the several another specialties: Computer Science, Software Engineering, Physical Materials Science. Students of these specialties successfully studied the following disciplines as part of the pilot teaching: Biomedical materials and structures (16 st.), CAD / CAM / CAE systems (54 st.), Cyber physical systems (14 st.).

In addition, two online pilot trainings were organized and performed in November 2020 (https://zp.edu.ua/uploads/news/20201116/NUZP_ID_Programm_16_11_2020.pdf, https://zp.edu.ua/internacionalizaciya-vdoma-dlya-rozbudovy-potencialu-politehnichnoyi-osvity-v-ukrayini) and in June 2021 (https://bioart.iucc.ac.il/wp-content/uploads/2021/06/agenda_BIOART_VNTU_PilotTeaching_31.05-3.06_final-1.pdf).

91 students took part in these activities.

Performed lectures are available on the YouTube channel: https://youtu.be/tdDnPXm8ir0, https://youtu.be/VIsaErRMnos, https://youtu.be/H_D0oE7qY1E, https://youtu.be/cZdJndh3Mbs, https://youtu.be/6MxbxtbxeQc, https://youtu.be/XSvXxalrOVM, https://youtu.be/-ixZu93M2xA.

N	Module	Responsible person (First and last name, faculty, department, affiliation, e-mail)	Group/ Number of students	Terms of Pilot teaching
1	Biomedical materials and structures	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science	IF-210/6 IF-210sp/1 IF-510/4 IF-510ch/2 ---------- IF-219m/1 IF-619m/1 ---------- graduate student/1	Spring semester 2020/2021 _____ Fall semester 2020/2021
2	Embedded biomedical systems and wireless sensor networks	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department	RT-220m, 2 students	Fall semester 2020/2021

3	CAD of biomedical devices and structures	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department	RT-220m, 2 students	Spring semester 2020/2021
4	CAD / CAM / CAE systems	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department	CST-120m, 210m, 220m, 54 students	Fall semester 2020/2021
5	Cyberphysical systems	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department	CST 220m, 14 students	Fall semester 2020/2021
6	Medical information infrastructure	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	RT-220m, 2 students,	Fall semester 2020/2021
7	Computer project management systems, regulation and standardization in the medical field	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	RT-220m, 2 students,	Spring semester 2020/2021
8	Online pilot teaching in NUZP (link in section 3.2)	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	78 students	November, 2020
9	Online pilot teaching in VNTU (link in section 3.2)	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department	13 students	June, 2021

2.2 Students' scientific work related to project theme (Science Week-2021, etc.)

N	Faculty, department	Title of scientific work	First and last name of student, group	First and last name of supervisor, affiliation, department
1	Faculty of Engineering and Physics	Optimization of the chemical composition of magnesium alloy for biodegradable implants	Alexander Lukyanenko, graduate student	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
2	Faculty of Engineering and Physics	Optimization magnesium alloy for medical use	Alexander Lukyanenko, graduate student	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
3	Faculty of Computer Science and	Development of a virtual environment for	Malyukov Mikhailo, master	Anzhelika Parkhomenko, Faculty

	Technology, Software Tools Department	the treatment of nervous and mental disorders in humans	student	of Computer Science and Technology, Associate professor of Software Tools Department
4	Faculty of Computer Science and Technology, Software Tools Department	Parametric modeling in automated design of an individual spinal implant	Mironenko Nadiya, master student	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Associate professor of Software Tools Department
5	Faculty of Computer Science and Technology, Software Tools Department	Application Development for Physical Rehabilitation using Oculus Rift	Trunova Daria, bachelor student	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department

2.3 Students' course projects related to project theme

N	First and last name of student	Group	Title of course project	First and last name of supervisor, affiliation, department
1	Demidenko Eduard	IF-219m	Influence of modification with noble metals on the structure and properties of biosoluble magnesium alloy implants	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
2	Kolesnik Ilona	IF-619m	Influence of melt overheating on structure formation and mechanical properties of ML5 alloy	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
3	Vaskin Bogdan	CST-110m	Research and development of control interface of robotic prosthetic of arm	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department
4	Komir Mykola	RT-220m	RESEARCH AND DEVELOPMENT OF THE CONTROL SYSTEM CLIMATE OF MEDICAL PREMISES	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department

2.4 Students' diploma projects related to project theme

N	First and last name of student	Group	Title of diploma project	First and last name of supervisor, affiliation, department
1	Demidenko Eduard	IF-219m	Modeling the influence of the cooling rate of casting from the ML10 alloy on the parameters of	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of

			its microstructure	Materials Science
2	Kolesnik Ilona	IF-619m	Influence of high-temperature treatment of the melt on the structure formation and mechanical properties of the ML5 alloy	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
3	Hunko Ernest	CST-119m	Recommendation system for improving the living standards of the elderly	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
4	Kushch Anastasya	CST-219m	QUALITY ASSESSMENT OF MEDICAL TRAINING VIDEO CONTENT ON YOUTUBE PLATFORM	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
5	Soberzhanska Svitlana	CST-219m	RESEARCH AND SOFTWARE IMPLEMENTATION OF A BOT-CONSULTANT FOR THE MEDICAL FIELD	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department
6	Frolova Anastasya	CST-219m	INFORMATION TECHNOLOGY OF DESIGNING A VIRTUAL PROTOTYPE OF A ROBOTIC PROSTHESIS	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
7	Yakubovskiy Denis	RT-229m	Research and practical implementation of a paramedic bracelet prototype	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
8	Popovich Vasil	RT-229m	Research and practical implementation of a cyber prosthesis prototype	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
9	Goncharova Alina	CST-217	Information System Development for Detecting the Deadliest Diseases	Olga Gladkova, Faculty of Computer Science and Technology, Software Tools Department
10	Bezruk Yegor	RT-229m	Influence of rare earth elements on structure formation, mechanical properties and toxicity of biosoluble magnesium alloy implants	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
11	Vereshchak Vladislav	RT-229m	Development of information system for medical laboratory	Olga Petrova, Faculty of Radio Electronics and Telecommunications, Associate professor of Radio Engineering and Telecommunications Department
12	Krokhin Vladimir	RT-229m	Research and implementation of recognising algorithms for characteristics of dental implants	Olga Petrova, Faculty of Radio Electronics and Telecommunications, Associate professor of Radio Engineering and Telecommunications Department

13	Petrov Yuri	RT-229m	Investigation of the influence of biosoluble magnesium alloy refining on the quality of implants for osteosynthesis and their reparative osteogenesis	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
14	Polyansky Eduard	RT-229m	Development of information infrastructure for the investigation of medical materials	Olga Petrova, Faculty of Radio Electronics and Telecommunications, Associate professor of Radio Engineering and Telecommunications Department
15	Roenko Alexander	RT-229m	Research and software implementation of medical records processing based on tests	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
16	Sumaryuk Stanislav	RT-229m	Medical cardio data monitoring and analysis system	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Head of Radio Engineering and Telecommunications Department
17	Palega Anastasia	RTz-229m	A method of measuring heart rate by wireless sensors	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Head of Radio Engineering and Telecommunications Department
18	Chistenko Stanislav	RTz-229m	Measurements of pulseoxymetric indicators with STM32-based microprocessing system	Sergey Morshchavka, Faculty of Radio Electronics and Telecommunications, Head of Radio Engineering and Telecommunications Department
19	Bezugla Anna	CST-217	Application Development for Healthcare Patients Recognition in Video	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department
20	Trunova Daria	CST - 227	Application Development for Physical Rehabilitation Using Oculus Rift	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department
21	Sheludko Vladislav	CST-118c	Web Application Development for Supporting an Electronic Health Record Based on Blockchain	Olena Shytikova, Faculty of Computer Science and Technology, Associate Professor of Software Tools Department
22	Dubetskiy Andriy	CST-219m	Research and Software Implementation of Methods for Bioengineering Risk Assessment	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department

3 Dissemination

3.1 Activities and dissemination materials

Students and lecturers are presented the results of their scientific research on the subject of the BIOART project in 23 papers during Scientific and Practical Conferences on Current issues and achievements in the field of radio engineering, telecommunications and information technology, on Smart and Wireless Systems within the International Conference on Intelligent Data Acquisition and Advanced Computing Systems, on New Materials and Technologies in Mechanical Engineering-2020, on Prospects for the development of mechanical engineering and transport, on The Experience of Designing and Application of CAD Systems, on Smart Information Systems and Technologies.

N	Titles of published papers and conference proceedings	Publication data	Authors	Faculty, department
1	Investigation of the influence of casting cooling rate on microstructure and properties of a new biosoluble magnesium alloy Mg-Zr-Nd for osteosynthesis.	XII International Scientific and Technical Conference: "New Materials and Technologies in Mechanical Engineering-2020": Coll. abstracts, Kyiv, NTUU "KPI". - P. 45.	Shalomeev VA, Aikin MD	Faculty of Engineering and Physics
2	Development of rational modes of heat treatment of biosoluble magnesium alloy.	XII International Scientific and Technical Conference: "New Materials and Technologies in Mechanical Engineering-2020": Coll. abstracts, Kyiv, NTUU "KPI". - P. 48	Shalomeev VA, Aikin MD	Faculty of Engineering and Physics
3	Modification of ML5 magnesium alloy with carbon nanopowder.	AVIATION AND SPACE ENGINEERING AND TECHNOLOGY, 2020, № 8 (168), p. 130-135.	Shalomeev VA, Makovsky SG, Lukinov VV ,, Klochikhin VV, Sheiko SP	Faculty of Engineering and Physics
4	Heat-resistent magnesium-based alloys for aircraft casting.	Metal Science and Treatment of Metals, 2020, № 3 (95), p. 16-24.	Shalomeev VA, Tsivirko E.I., Klochyhin V.V.	Faculty of Engineering and Physics
5	Optimization of the chemical composition of magnesium alloy for biodegradable implants.	X International scientific-practical conference "Modern problems and achievements in the field of radio engineering" collection of abstracts, October 07-09, 2020, Zaporozhye, NU "ZP". - P. 240.	Shalomeev VA Lukyanenko O.S., Aikin M.D.	Faculty of Engineering and Physics
6	Investigation of the influence of cooling	New materials and technologies in metallurgy and mechanical	Shalomeev VA Lukyanenko O.S.,	Faculty of Engineering and

	rates during crystallization on the structure and properties of the alloy of the Mg-Zr-Nd system.	engineering. - 2020, №1. - P.25-33.	Aikin M.D.	Physics
7	Improving the structure and properties of medical magnesium alloys.	II International Scientific and Technical Conference: "Prospects for the development of mechanical engineering and transport": Coll. abstracts, May 13-15, 2021, Vinnytsia, VNTU. - P. 52-53.	Shalomeev VA Lukyanenko O.S.,	Faculty of Engineering and Physics
8	Information technology of robotic prosthesis computer-aided design based on parametric modeling	2021 IOP Conf. Series: Materials Science and Engineering, 1016 (1), 012016	A. V. Parkhomenko, O. M. Gladkova, Y. I. Zalyubovskiy, A. V. Parkhomenko	Faculty of Computer Science and Technology, Software Tools Department
9	Adaptation of CAD-system Creo for Development of Individual Spinal Implant	16th International Conference on The Experience of Designing and Application of CAD Systems, Lviv, Ukraine, 22–26 February 2021: proceedings. – Los Alamitos: IEEE, 2021. – P.1-5	O. Gladkova, A. Parkhomenko, N. Myronenko, A. Parkhomenko, Ya.Zalyubovskiy, M. Andreiev	Faculty of Computer Science and Technology, Software Tools Department
10	Mathematical and software tools for decision making, pattern recognition and intelligent diagnosis	monograph / under the general. ed. SO Subbotin. - Zaporozhye: NU "Zaporizhzhia Polytechnic", 2020. - 271 p.	S. Subbotin, A. Oliynyk, E. Fedorchenko et al.	Faculty of Computer Science and Technology, Software Tools Department
11	Intelligent Data Analysis for Individual Hypertensia Patient's State Monitoring and Prediction	IEEE International Conference on Smart Information Systems and Technologies (SIST), 2021, pp. 1-4, doi: 10.1109/SIST50301.2021.9465989.	S. Subbotin, G. Tabunshchyk, P. Arras, D. Tabunshchyk, E. Trotsenko,	Faculty of Computer Science and Technology, Software Tools Department
12	Model of risks control in medical systems	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP.pp.262-263	G. Tabunshchyk, O. Shytikova	Faculty of Computer Science and Technology, Software Tools Department
13	Adaptation of Smart House System for People with Special	Proceedings of the 5th IEEE International Symposium on Smart and Wireless Systems	A.Tulenkov, Y.Yaremchenko, Y.Zalyubovskiy,	Faculty of Computer Science and

	Needs Based on Wireless Technologies	within the International Conference on Intelligent Data Acquisition and Advanced Computing Systems, 17-18 September, 2020, Dortmund, Germany, pp.12-17	A.Parkhomenko, M. Kalinina	Technology, Software Tools Department
14	Recommendation system for improving the living standards of the elderly	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 248-249	Hunko E.V., Gladkova O.M., Parkhomenko A.V.	Faculty of Computer Science and Technology, Software Tools Department
15	QUALITY ASSESSMENT OF MEDICAL TRAINING VIDEO CONTENT ON YOUTUBE PLATFORM	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 250-251	Kushch A.V., Gladkova O.M., Parkhomenko A.V	Faculty of Computer Science and Technology, Software Tools Department
16	INFORMATION TECHNOLOGY OF DESIGNING A VIRTUAL PROTOTYPE OF A ROBOTIC PROSTHESIS	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 260-261	Frolova A.Yu., Parkhomenko A.V, Gladkova O.M.	Faculty of Computer Science and Technology, Software Tools Department
17	RESEARCH AND SOFTWARE IMPLEMENTATIO N OF A BOT-CONSULTANT FOR THE MEDICAL FIELD	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 258-259	Soberzhanska S.Yu., Parkhomenko A.V., Zalyubovsky Ya.I.	Faculty of Computer Science and Technology, Software Tools Department
18	Definition of locally sensitive hashes for construction of recognition and diagnostic models	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp.118-119	Subbotin S.O.	Faculty of Computer Science and Technology, Software Tools Department

19	Swelling cata-ract diagnosing using neural network	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 237-239	Diachuk T.S., Skrupsky S.Yu., Diachuk I.V., Kylukovska N.A.	Faculty of Computer Science and Technology, Department of Computer Systems and Networks
20	Optimization of the chemical composition of magnesium alloy for biodegradable implants	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp.240-241	Shalomeev V.A., Lukyanenko O.S., Aikin M.D.	Faculty of Engineering and Physics, Department of Materials Science
21	Simplifying peak detection algorithms for finite biomedical signals	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 241-243	Sumariuk S., Morshchavka S., Luengo D.	Faculty of Radio Electronics and Telecommunications, Department of Radio Engineering and Telecommunications, Madrid Polytechnic
22	Possibilities of telemedicine involvement in the diagnostic process	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp.256-258	Samoilyk S.S., Samoilyk K.V.	Faculty of Radio Electronics and Telecommunications, Department of Radio Engineering and Telecommunications
23	Electronic service "Medical reform for people"	Proceedings of the IX International Scientific and Practical Conference on Current issues and achievements in the field of radio engineering, telecommunications and information technology (October 07-09, 2020, Zaporozhye). Zaporozhye: NUZP, pp. 243-245	Bakurova A.V., Tereshchenko E.V., Shirokorad D.V.	Faculty of Computer Science and Technology, Department of Systems Analysis and Computational Mathematics

3.2 Web-publications

1. New curriculum "Telemedicine and biomedical systems" (2nd level - master) https://zp.edu.ua/sites/default/files/konf/navchalnyy_plan_biomed_2019_2020.pdf
2. Disciplines for the educational/professional program "Telemedicine and biomedical systems" (2nd level - master): https://zp.edu.ua/?q=node/327
3. New equipment for equipping laboratories https://zp.edu.ua/nove-obladnannya-dlya-osnashchennya-laboratoriy
4. Successes in the implementation of an international educational project BIOART https://zp.edu.ua/uspihy-v-realizaciyi-mizhnarodnogo-osvitnogo-proyektu-bioart
5. Program of the International Days 18-20 November 2020 https://zp.edu.ua/uploads/news/20201116/NUZP_ID_Programm_16_11_2020.pdf
6. Internationalization at home to build the potential of polytechnic education in Ukraine https://zp.edu.ua/internacionalizaciya-vdoma-dlya-rozbudovy-potencialu-politehnichnoyi-osvity-v-ukrayini
7. PILOT TEACHING, VNTU (31 May – 3 June, 2021) https://bioart.iucc.ac.il/wp-content/uploads/2021/06/agenda_BIOART_VNTU_PilotTeaching_31.05-3.06_final-1.pdf
8. https://youtu.be/tdDnPXm8ir0
9. https://youtu.be/VIsaErRMnos
10. https://youtu.be/H_D0oE7qY1E
11. https://youtu.be/cZdJndh3Mbs
12. https://youtu.be/6MxbxtbxeQc
13. https://youtu.be/XSvXxalrOVM
14. https://youtu.be/-ixZu93M2xA

4 National student contest (7 April, 2021, https://youtu.be/pelwHiE0gPk)

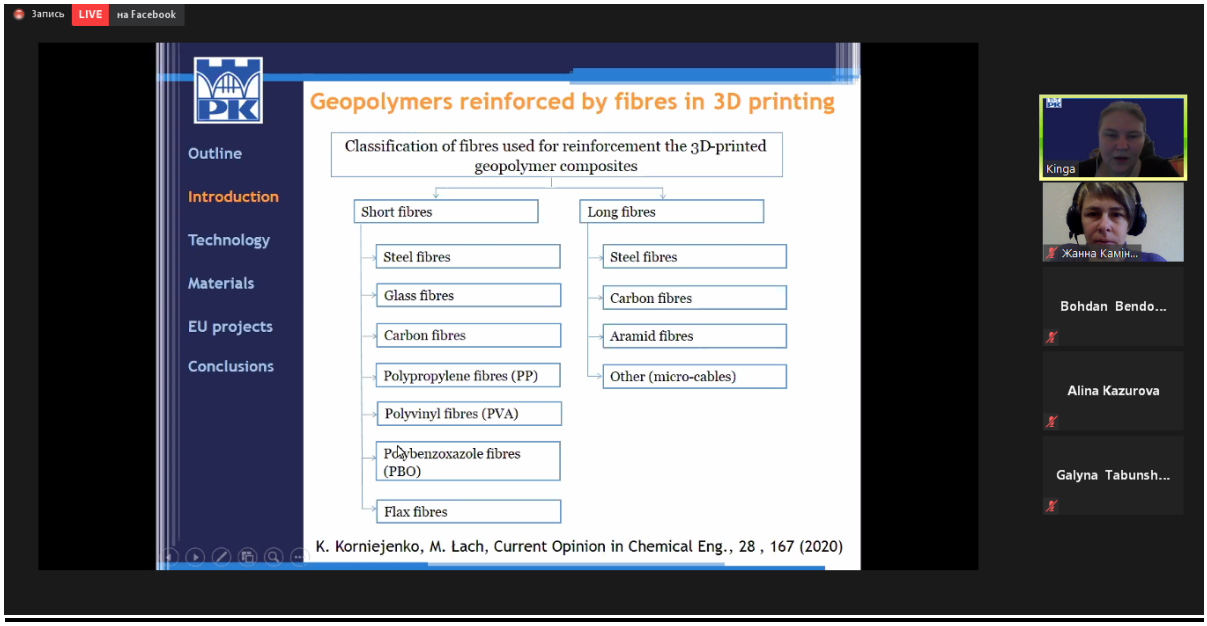
In 2021 there were 4 students-participants of university contest (1st place - Alexander Lukyanenko, 1st place - Daria Kolpakova, 2nd place - Trunova Daria, 3d place - Oleksandr Berezhnyi).

In 2020 the same number of students-participants were (Nikita Aykin, Eduard Demidenko, Yevhenii Yaremchenko, Serhii Leoshchenko).

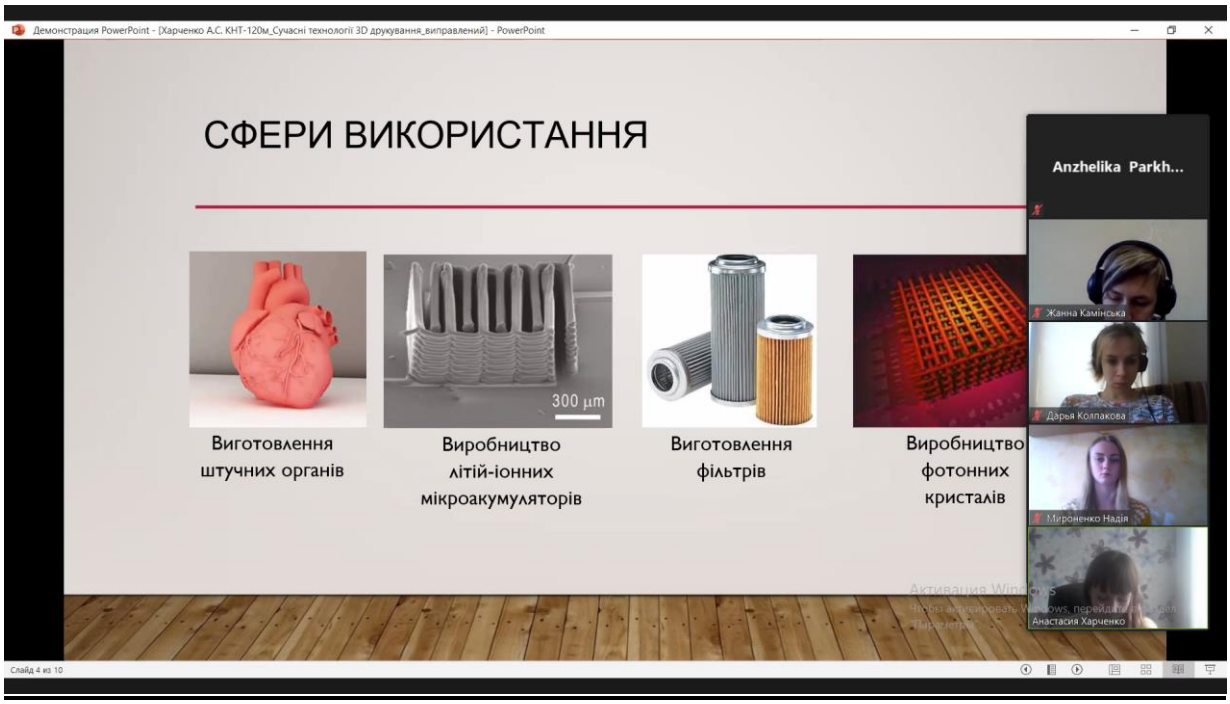
Place	First and last name of student	Group	Title of project	First and last name of supervisor, affiliation, department
Section 1 - Material science in Bioengineering				
1	Alexander Lukyanenko	graduate student	Mathematical modeling and graphical optimization of magnesium-based biodegradable alloy for osteosynthesis	Vadim Shalomeev, Faculty of Engineering and Physics, Professor of the Department of Materials Science
Section 2 - Informational Technologies in BioEngineering				
1	Daria Kolpakova	Master student	Research and development of a mobile application with a non-invasive glucometer for patients with diabetes	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department
2	Trunova Daria	bachelor student	Application Development for Physical Rehabilitation using Oculus Rift	Galyna Tabunshchyk, Faculty of Computer Science and Technology, Professor of Software Tools Department

3	Oleksandr Berezhnyi	bachelor student	Research and development of software and hardware for the implementation of video monitoring in medical institutions	Anzhelika Parkhomenko, Faculty of Computer Science and Technology, Software Tools Department

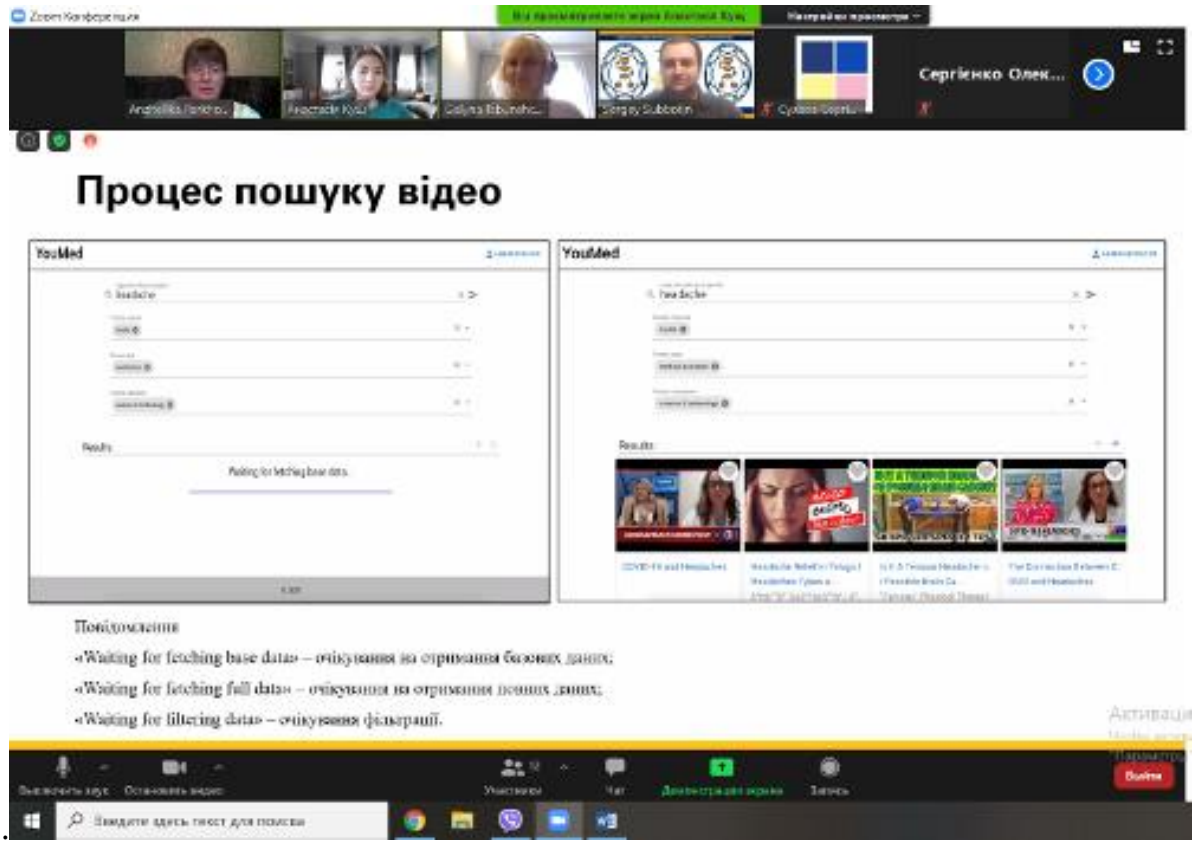
5 Support screenshots and documents



Participation of students in lectures of teachers of foreign universities in the framework of the International Days, on the occasion of the 120th anniversary of polytechnic education in the Zaporozhye region (November 18-20, 2020), 15 students received Certificates



Online seminar "Modern additive production technologies", attended by 10 students November 14, 2020.



Defense of a master's thesis: «The filtering of medical content on the You Tube platform» (Anastasia Kushch (CST-219m), December 14, 2020).

Examples of Certificate for Student contest

Co-funded by the Erasmus+ Programme of the European Union

CERTIFICATE OF ATTENDANCE

No 26 // 10/06/2021/ BioArt

ANZHELIKA PARKHOMENKO

Has attended

in the **All Ukrainian Pilot Teaching Week**

«Innovative Multidisciplinary Curriculum in Artificial Implants for Bio-Engineering BSc/MSc Degrees» – BioArt

Under the Erazmus+ Programme – Capasity Building in Higher Education

Held in ***Vinnytsia National Technical University, Ukraine,***

31 May – 4 June 2021

Main Project Coordinator BIOART David Luengo

Coordinator BIOART in VNTU Oleksandr Hrushko

Vinnytsia, 2021

Example of Certificate for All Ukrainian Pilot Teaching Week

6 Questionnaire for students

1. Evaluate the benefits of your studies in your specialty at the university
   A. Not satisfied
   B. Completely satisfied with the training
   C. Partly satisfied, sufficient theoretical preparation but lack practical

2. What do you think should be changed in the educational program (curriculum) in which you studied?
   A. Nothing
   B. More practical format training
   C. Apply innovative learning technologies

3. During your studies at the university, did you take an internship / study / trainings at enterprises?
   A. No
   B. Yes, but I found a place for myself
   C. Yes, the university gave me a place of practice

4. What additional benefits would be done at the university or at the department in order to facilitate your employment after graduation? (By priority)
   - Nothing
   - More practice
   - More cooperation with companies
   - Your option_____

5. Evaluate the attitude towards you personally from the teachers of the department.
   A. Completely satisfied with the attitude
   B. Partly satisfied (most teachers are good)
   C. Most teachers treat poorly

6. What form of training organization would be the best for you personally?
   A. Everything has to be just face to face (lectures and lab works in the classroom).
   B. Lectures should be face to face, and laboratory work - remote.
   C. Lectures should be remotely and laboratory work should be face to face.
   D. Everything should be remote only (lectures in Zoom, etc., lab works in Moodle / Google classroom).

The survey results showed that in 2020 50.69% of bachelor students were satisfied with the training and in 2021 - 58.16 %. For master students these indicators were 52.05% (in 2019) and 59.26% (in 2020).

However, bachelor students find that it is necessary to add more practical format training, and master students find that it is necessary to apply more innovative learning technologies.

75.12% bachelor students in 2020 and 87.87% bachelor students in 2021 were completely satisfied with the attitude towards them from the lecturers. For master students this indicator is 77 % in 2020.

With the aim to facilitate their employment after graduation students proposed to add to the educational process more practice, More cooperation with companies, trainings from companies, Lessons from care at employment.

Recommendations for curriculum enhancement:

- It is suggested by accreditation comity to consider current trends in non-formal and informal education, as well as to implement them for the update the content of the curricula.
- The feedback from students through surveys and involvement in scientific projects of the graduating department, including international ones should be done on regular base.
- It should be payed attention to the recognition procedure of the learning outcomes in non-formal education.
- It is recommended to continue to implement in the educational process the scientific results obtained in the framework of scientific works.
- It is recommended to supplement the list of disciplines on the page of the graduating department, with the corresponding redirection to the pages of profile departments.
- The work towards attracting employers to provision and formation of the educational process should be continued.
- To attract more students its recommended to implement double diplomas as inside university as with the partner eu university.

National co-ordinators IL/UA: Cooperation with such universities as Lviv Polytechnic University, Kharkiv University of Radio electronics, Odessa State Polytechnic University and others allows to disseminate information about new developed courses in Ukraine. Organisation of the summer and winter schools where students from different unverisites could participate. Also could be organised T4T sessions as part of academic internship.

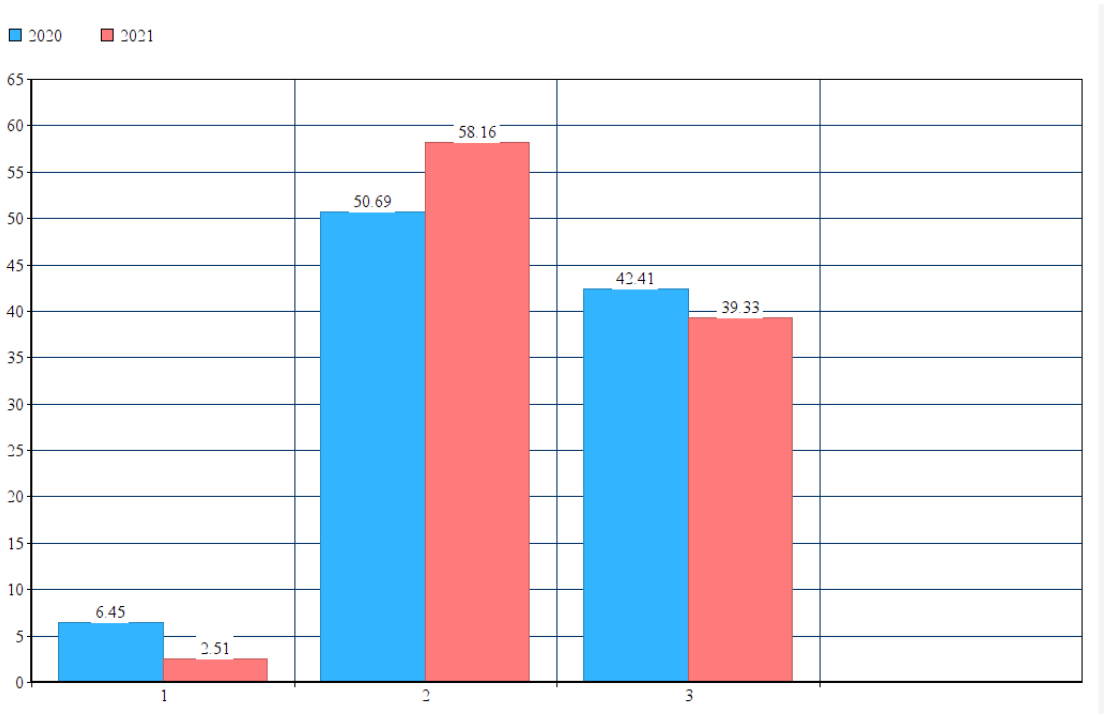
Also VNTU, NUZP and DGMA passed accreditation of the Master curricula according the new rules and all programs were higly assessed as innovative and highly required at labour market and which could be considered as best practice for other universities.

7 Results of the survey of bachelor and master students in 2019-2021

1. Evaluate the benefits of your studies in your specialty at the university

Table 1 – Bachelor students

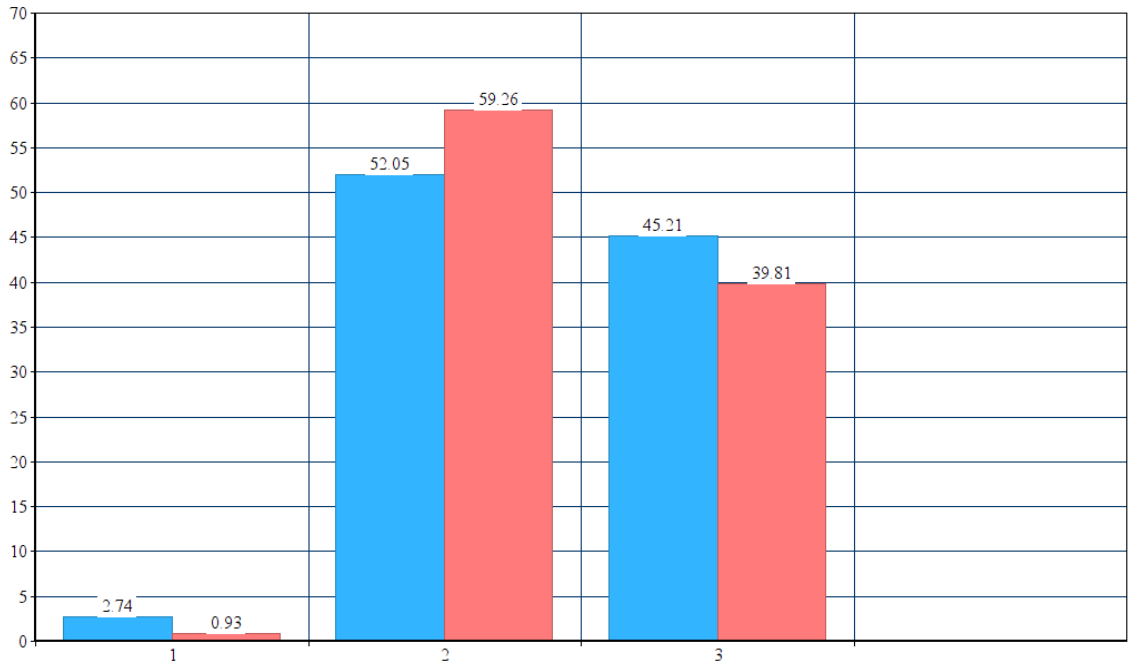
	2020	**2021**
Not satisfied	6.45%	2.51 %
Completely satisfied with the training	50.69%	58.16 %
Partly satisfied , sufficient theoretical preparation but lack practical	42.41 %	39.33%



1- Not satisfied
2- Completely satisfied with the training
3 – Partly satisfied, sufficient theoretical pi Preparation but lack practical

Table 2 - Master students

	2019	**2020**
Completely satisfied with the training	52.05%	59.26%
Partly satisfied , sufficient theoretical preparation but lack practical	45.21%	39.81 %
Not satisfied	2.74%	0.93%



1- Not satisfied
2- Completely satisfied with the training
3 - Partly satisfied, sufficient theoretical preparation but lack practical

2. What do you think should be changed in the educational program (specialty) in which you studied?

Bachelors 2020

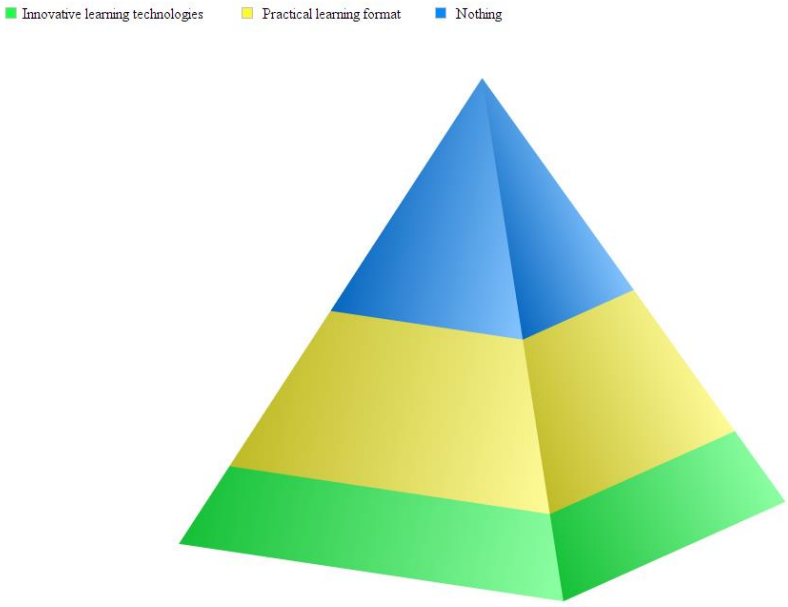


Table 3- Bachelors 2020

Nothing	1
More practical format training	2
Apply innovative learning technologies	3

Bachelors 2021

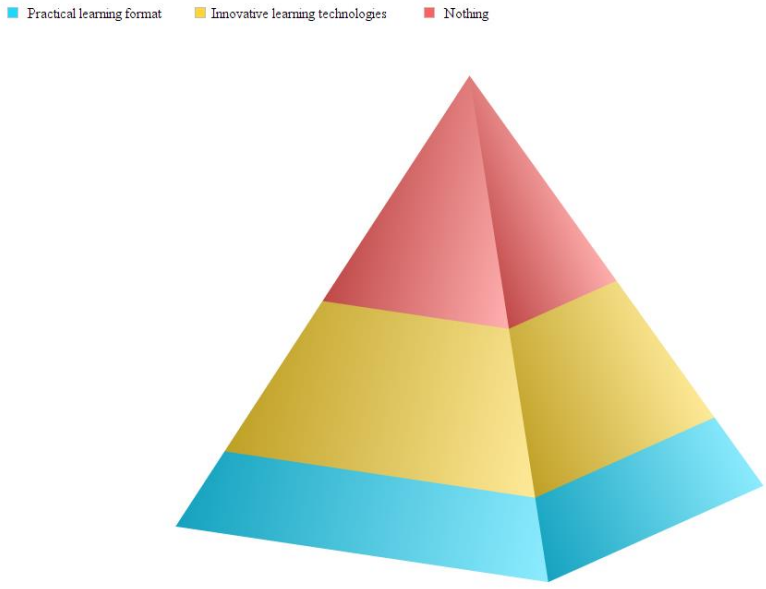


Table 4 - Bachelors 2021

Nothing	1
Apply innovative learning technologies	2
More practical training format	3

Masters 2020

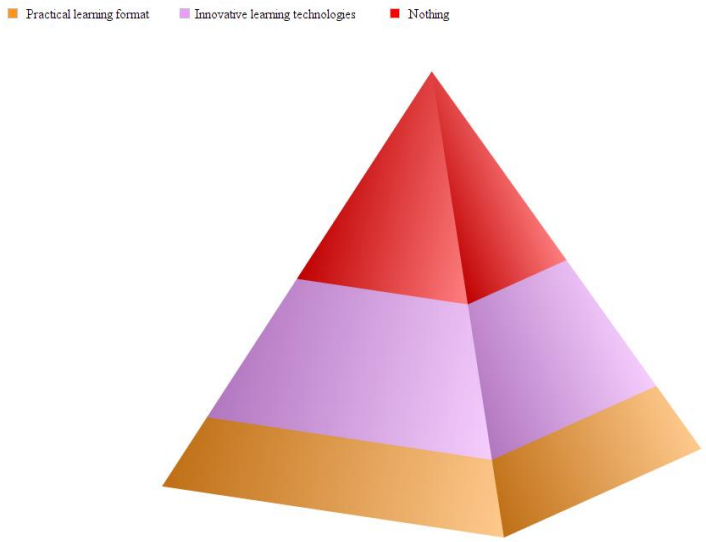


Table 5- Master students 2020

Nothing	1
Apply innovative learning technologies	2
More practical training format	3

2. During your studies at the university, did you take an internship / internship / study / trainings at enterprises?

Bachelors

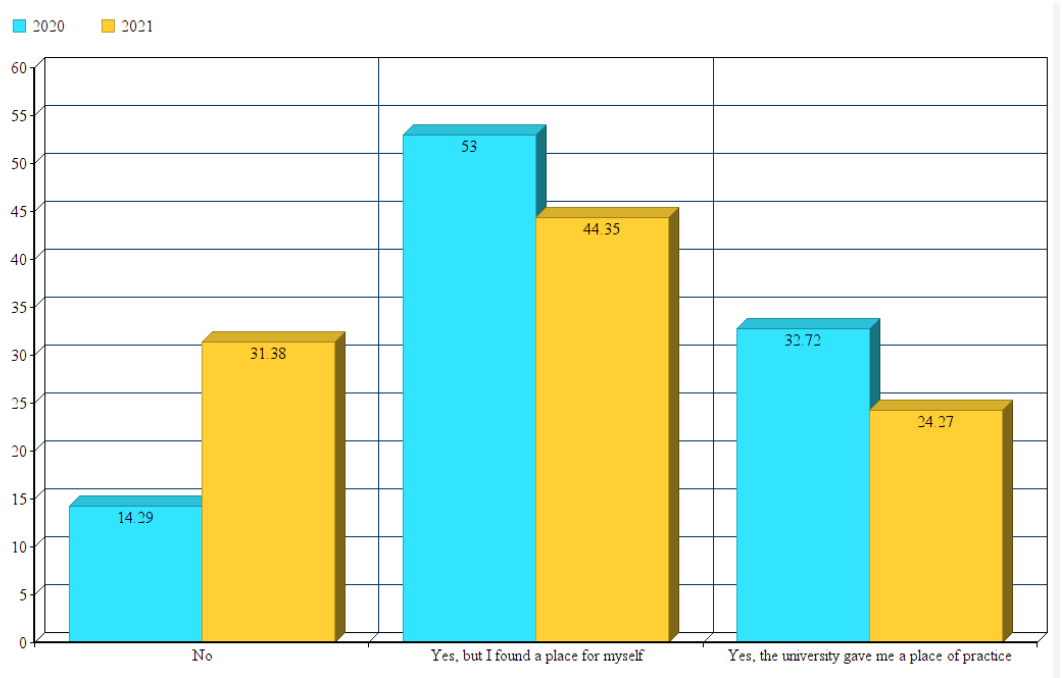


Table 6 - Bachelors

	2020	**2021**
No	14.29%	31.38%
Yes, but I found a place for myself	53%	44.35%
Yes, the university gave me a place of practice	32.72%	24.27%

Compared to 2020, in 2021 fewer students underwent internships at the enterprises.

Masters

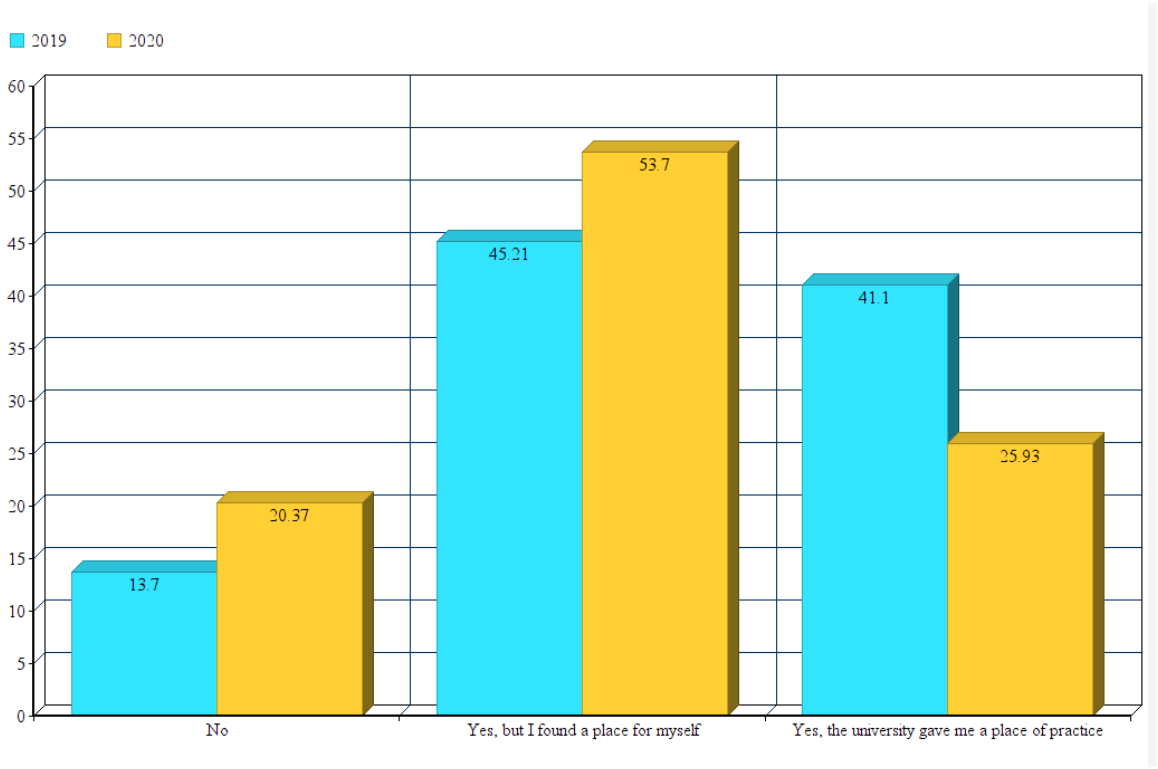


Table 7 – Master student

	2019	2020
Yes, the university gave me a place of practice .	41.10%	25.93%
No .	13.70%	20.37%
Yes, but I had a znaysho in place practices.	45.21%	53.70%

What additional benefits would be done at the university or at the department in order to facilitate your employment after graduation?

Table 8 – Bachelors 2021

Nothing	1
More practice	3
More cooperation with companies	2
Lessons from care at employment	4

Table 9 – Bachelors 2020

Nothing	1
More cooperation with companies , internships	2
More practice	3
Actuality program training	4

Table 10 – Masters students 2019

Nothing	1
More practice	2
Lessons from care at employment	3
More cooperation with companies	4

Table 11 – Masters students 2020

Nothing	1
More cooperation with companies , trainings from companies	2
More practice	3

3. Evaluate the attitude towards you personally from the lecturers of the department.

Bachelors

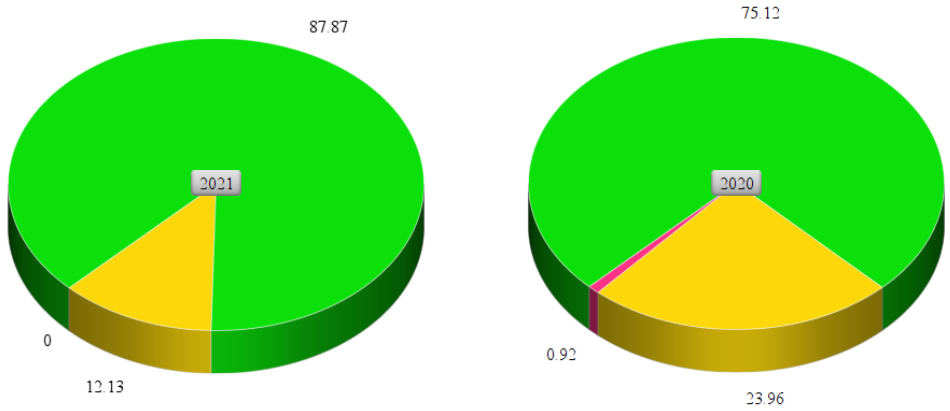


Table 12– Bachelors

	2020	2021
Completely satisfied with the attitude	75.12%	87.87%
Partly satisfied (most teachers are good)	23.96%	12.13%
Most teachers treat poorly	0.92%	**0 %**

In 2021, students` satisfaction with the attitude of lecturers is increased

Masters 2020

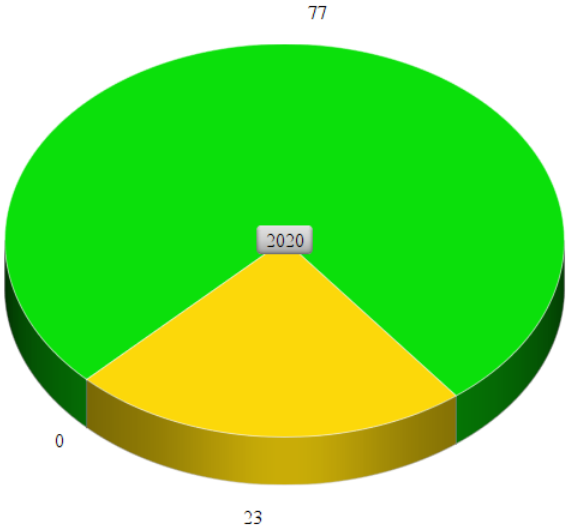


Table 13 – Master students

Completely satisfied with the attitude .	77 %
Partly satisfied : most teachers are well.	23%
Most teachers treat poorly	0%

4. What form of training organization would be the best for you personally?

Bachelors 2021

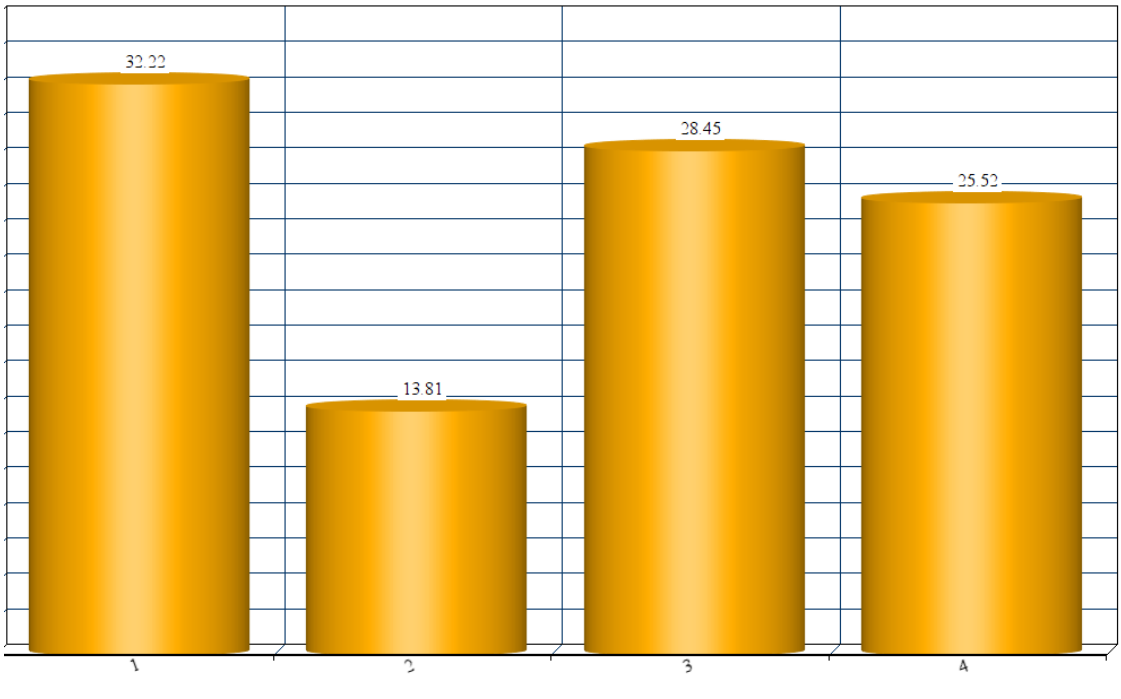


Table 14 - Bachelors 2021

Everything has to be just face to face (lectures and lab works in the classroom)	32.22%
Lectures should be face to face, and laboratory work - remote	13.81%
Lectures should be remotely and laboratory work should be face to face	28.45%
Everything should be remote only (lectures in Zoom, etc., lab works in Moodle / Google classroom).	25.52%