THE REPUBLIC OF UZBEKISTAN

MINISTRY OF HIGHER AND SECONDARY SPECIALIZED EDUCATION

ANDIJAN MACHINE - BUILDING INSTITUTE

To get the list is:

№ 691

2022-y «08» 29

"CONFIRMED"

Vice-rector for educational work

a.t.p. _____ S.R.Aliyev

29 08 2022-y

« ROBOTOTECHNICAL COMPLEXES AND SYSTEMS »

SCIENCE

WORKING TRAINING PROGRAM

Education: 310000 – Engineering work

The direction of Education: 5312700- Intellectual engineering systems. (Networks and fields by)

General training hour	**112 hour**	**5- semester**
Lecture	32 hour	32 hour
Practical training	32 hour	32 hour
Laboratory classes	-	-
Independent training hour	48 hour	48 hour

Andijan – 2022

The working curriculum of the subject was prepared on the basis of the program of the subject " Robototechnical Complexes And Systems " approved by the order of the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan dated "___" _____ of 2022.

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I. Relevance of educational science and its role in higher professional education

This subject covers prospective issues of robotic complexes and systems, their constituent parts and development trends. The use of robots and robotic systems in the complex automation of production, mastering new technological processes with the help of robots and robotic systems, freeing people from tedious, same, heavy manual work, harmful and dangerous work for their health, robots equips students with the knowledge necessary to understand the essence of its wide application in various fields of production.

It is required to have sufficient knowledge and skills in mathematical and natural sciences (mathematics, physics, information technology in technical systems, information processing and algorithm) and (engineering and computer graphics) planned in the curriculum of the program implementation. . This science forms the theoretical and methodological basis of other specialized sciences and serves as a ground for specialized sciences in a specific direction in its development.

II. Purpose and function of educational science

The goal is to read science - the formation of knowledge, skills, and qualifications in accordance with the profile of the educational direction for students on the structure, classification, technical recommendations of robotics complexes and systems, the principle of module construction of robots, manipulators of robots and their kinematic schemes, working bodies, software of robots, adaptive and intellectual control systems, robotics systems, application of robots

To achieve this goal, the science performs the tasks of forming students with theoretical knowledge, practical skills, a methodological approach to the processes taking place in robotics complexes and systems, as well as a scientific worldview.

The following requirements are imposed on the knowledge, skills and abilities of students in the subject. Student:

- to have an idea of the structure, classification of robotics complexes and systems;
- the structure of robotic complexes, the principle of module construction of robots, manipulators of robots and their kinematic schemes, working bodies, software of robots, adaptive and intellectual control systems, knowledge and access to robotics systems;
- the student must have the skills to adopt solutions on the application of robotics complexes and systems, such as mobile robotics systems.

III. Main theoretical part (lecture sessions)

In the main part, the topics of science are brought in a logical sequence. The essence of each topic is revealed through basic concepts and theses. This should fully cover the knowledge and skills required to be delivered on the basis of DTS to students on the subject.

It is recommended that the demand for the quality of the main part covers the relevance of the topics, their compliance with the requirements of employers and production needs, socio-political and democratic changes taking place in our country, the priority issues of reforms in the liberalization of the economy, economic and legal and other spheres, and that the latest achievements of Science and

Lecture sessions

1- table

T/R	Lecture sessions	Hour
	5-semester	
1.	**Robots and manipulators. Terms regarding robotic techniques**	**2**
1.1	To study the structure and principles of operation of robots and manipulators.	
1.2	Familiarity with terms related to robotic techniques.	
2.	**Industrial robot and its structure. Classification of robotic techniques.**	**2**
2.1	The study of an industrial robot and its structure.	
2.2	Studying the classification of robotic techniques.	
3.	**The use and development of robotic and robotic techniques in Automotive Engineering.**	**2**
3.1	Prospects for the use and development of robotic and robotic techniques in automotive engineering	
4.	**Basic elements that are part of the Robot technique. Robot control methods.**	**2**
4.1	Acquaintance with the main elements of the Robot technique.	
4.2	Learning methods to control robots.	
5.	**Adaptive and programmed robots. Intellectual robots**	**2**
5.1	The concept of adaptive and programmed robots.	
5.2	The concept of intelligent robots.	
6.	**The use of robotics complexes and requirements for them. The main types of robotics complexes.**	**2**
6.1	Familiarization with the use of robotics complexes and requirements for them.	
6.2	Study of the main types of robotics complexes	
7.	**Drawings for the use of industrial robots in production complexes**	**2**

7.1	Familiarization with the drawings of the use of industrial robots in production complexes	
8.	**Structure of robotics complexes**	**2**
8.1	The concept of the structure of robotics complexes.	
9.	**Use of robotics complexes in assembly processes**	**2**
9.1	Learning to use robotics complexes in assembly processes	
10.	**Automation of assembly operations with the help of robots.**	**2**
10.1	Methods for automating assembly operations using robots.	
11.	**Basics of choosing details for processing in robotic complexes. Robotics complexes for control of Stanok groups**	**2**
11.1	Fundamentals of the selection of details for processing in robotic complexes.	
11.2	Acquaintance with robotics complexes for control of Stanok groups	
12.	**The use of robotics complexes in pressing and hammering operations. Stamping industrial robots.**	**2**
12.1	The use of robotics complexes in pressing and hammering operations. Stamping industrial robots.	
13.	**Robotics complexes for the preparation of details by casting method.**	**2**
13.1	The concept of robotics complexes for the preparation of details by casting method.	
14	**The use of robotic complexes to control the currents of giving coatings to details.**	**2**
14.1	The use of robotic complexes to control the currents of giving coatings to details.	
15.	**Welding robotics complexes.**	**2**
15.1	Point contact welding complexes.	
15.1	Welding complexes with an electric arc.	
16.	**Task, requirements, classification of complexes for lifting and transporting detail and finished products.**	**2**
16.1	Task, requirements, classification of complexes for lifting and transporting detail and finished products.	
	Total	**32**

Lecture classes are held for the flow of academic groups in an audience equipped with multimedia structures.

IV. Instructions and recommendations for practical classes

Practical classes create practical skills and experience in the design of a technological process operation, which is a component of engineering decision-

making in students, knowing its structural elements, making appropriate calculations, solving examples and issues:

Practical training

2- table

N	Topics of practical classes	Hour
	5-semester	
1	Acquaintance with the principles of operation of the " xArm " robot and the UFACTORY-Studio program.	2
2	Setting up the robot "xArm" and studying the working zone.	2
3	Development of operations for lifting and transporting details using the "xArm" robot	2
4	Sensors used in the "xArm" robot	2
5	Using the camera in the "xArm" robot	2
6	Creation of a robotics complex using "xArm" robots.	4
7	Get acquainted with the principles of operation of the robot "xArm" and the xArm Studio program	2
8	Setting up the robot "xArm" and studying the working zone.	2
9	Development of operations for lifting and transporting details using the" warm " robot.	2
10	The use of a laser cutting device in the "xArm" robot.	2
11	Finding objects using the camera in the" warm " robot	2
12	3D printer device in the robot" "xArm"	2
13	Drawing up a robotic technical complex using ultrasound and color sensors in the "xArm" robot.	2
14	Performing a complex assembly operation using robots " xArm".	4
	TOTAL	**32**

Practical classes should be conducted by a teacher from an akadem group in an audience equipped with multimedia devices. It is advisable that classes are conducted using active and interactive methods, respectively, appropriate pedagogical and information technologies are applied.

V. Laboratory classes

"Robototechnical Complexes And Systems" on the subject of the course work (project) is not envisaged in the training plan.

VI . Instructions and recommendations for coursework, course project and calculation graphic work

"Robototechnical Complexes And Systems" on the subject of the course work (project) is not envisaged in the training plan.

VII. Independent Education.

Independent education of a student in "Computing machines, systems and networks " is a component of the process of studying this discipline and is fully provided with methodological and information resources.

4- table

N	Independent educational topics	Lesson hours volume
	5-semester	
1.	Basic definitions and concepts of industrial robots.	2
2.	First generation robotic systems.	2
3.	Application of industrial robots.	2
4.	Basic concepts about intelligent robots.	2
5.	Adaptive robotic systems.	2
6.	Adaptive industrial robots used in assembly operations.	2
7.	Assembly industrial robots and complexes.	2
8.	Automated teller machines and semi-automatic machines.	2
9.	Use of industrial robots in metal casting.	2
10.	Robotic welding complexes.	2
11.	Robotic complexes serving a group of workstations.	2
12.	Cold stamping robotic complexes.	2
13.	Hot stamping robotic complexes.	2
14.	Kinematics of industrial robot manipulators	2
15.	Management of industrial robot manipulators	2
16.	Working with digital signals on the xArm robot	2
17.	Analog sensors	2

18.	Systems of technical vision of industrial robots	2
19.	Palletizer robots	2
20.	Transmitters of industrial robots	2
21.	Auxiliary equipment of robotic complexes	2
22.	Devices for catching industrial robots	2
23.	Hydraulic and pneumo-hydraulic transmissions of industrial robots	2
24.	Pneumatic transmissions of industrial robots	2
	Total	**48**

It is recommended to prepare abstracts and make a presentation by students on topics that will be mastered independently.

IIX. Preachers of supervision and assessment of student knowledge in science

5-table

Evaluation methods	In other forms such as oral inquiry, testing, interview, control work, homework inspection, written work, presentations and the like
Evaluation criteria	**5 - " excellent " grade** - The student makes independent conclusions and decisions; - can think creatively; - independent observation; - can put into practice the knowledge gained; - understands, knows, can express, tell the essence of science (subject), and when it is found to have an idea of science (subject) – is assessed with 5 (excellent) grades. **4 – "good" grade** - The student observes independently; - can put into practice the knowledge gained; - understands, knows, can express, tell the essence of science (subject), and when it is found to have an idea of science (subject) - is evaluated by 4 (good) assessments. **3 – "satisfactory " assessment** - The student can put into practice the knowledge he has received; - understands, knows, can express, tell the essence of science (subject), and when it is found to have an idea

	of science (subject) - is evaluated with a 3 (satisfactory) assessment. **2 – "unsatisfactory" grade** - When a student does not master a science program, does not understand the essence of the subject (subject) and is found to have no idea of the subject (subject) - is assessed by an assessment of 2 (unsatisfactory).		
	Types of assessments	**maximum score**	**time**
	Intermediate control (the conduct of the IC type and the assessment of the student's knowledge of this type of control is carried out by the professor-teacher who conducted training in the subject). Intermediate control is carried out during the semester during training sessions in order to assess the knowledge and practical skills of students after the completion of the corresponding section of the working Science Program. The type of intermediate control can be carried out up to 2 times based on the nature of the subject in each subject, and the form and duration of the transfer are determined by the department based on the nature of the subject, the hours allocated to the subject. When assessing a student by the type of intermediate control, the grades that he received during training are taken into account. A student who has not submitted an intermediate type of control, as well as an assessment with an assessment of "2" (unsatisfactory) by this type of control, is not included in the final type of control.	**5**	9-16 week

	Final control Conducting the final type of control and assessing the student's knowledge in this type of control is carried out by a professor-teacher who has not conducted training sessions. The form of conducting the final type of control is determined by the nature of the science, based on the hours allocated to the science.	**5**	18-19 week
	Written work, Oral, test, etc	**5**	

IX. Main and additional educational literature and information sources

Main literature

1. John J. Criag Introduction to Robotics -Pearson Education International, 2022
2. David G. Michael B. Introduction to Mechatronics and Measurement Systems - McGraw-Hill, 2012
3. X.N.Nazarov Robotlar va robototexnik komplekslar. T.:. 2020.-238b.
4. N. R. Yusupbekov, r. A. Aliyev, r. R. Aliyev, a. N. Yusupbekov. Boshqarishning intelektual tizimlari va qaror qabul qilish. T.:. 2015 -184b
5. В. Г. Хомченко. Робототехнические системы. Омск, 2016 195с
6. Назаров Х.Н8,1,6,3. Робототехнические системы и комплексы. Т. 2004г. - 102с.
7. uArm_Swift_Pro_User_Manual-V1.1.23
8. xArm User Manual

Additional literature

1. Mirziyoyev SH.M. Erkin va farovon, demokratik O‘zbekiston davlatini birgalikda barpo etamiz. O‘zbekiston Respublikasi Prezidantining lavozimiga kirishish tantanali marosimiga bag‘ishlangan Oliy Majlis palatalarining qo‘shma majlisidagi nutqi. –T.:”O‘zbekiston” NMIU, 2016.-56 b.
2. O‘zbekiston Respublikasi yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida – T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.
3. Робототехника/ Ю.Г.Андереанов М. : Машиностроение 1984г.-326с.
4. Шахинур Н. Курс робототехники. М.Мир 1990г.- 420с.

5. Белянин Н.П. Робототехнические комплексы и машиностроение. М.Машиностроение. 1989г.-312с.
6. Тимофеев А.В. Адаптивные робототехнические комплексы.Л.:Машиностроение. 1988г.- 332с.

Of the internet site

1. www.gov.uz – O‘zbekiston hukumat portali.
2. www.catback.ru - научные статьи и учебные материалы
3. www.lex.uz – O‘zbekiston Respublikasi Qonun hujjatlari milliy bazasi.
4. http://elkutubhona.narod.uz;
5. www.tuit.uz;
6. www.ziyonet.uz;
7. www.edu.uz;
8. www.multimedia.com;
9. www.microsoft.com.ru;
10. http://www.cpd.meria.ru/-team/index.html
11. http://www.robotics.uc.edu
12. http://www.robotics.utexas.edu./rrg