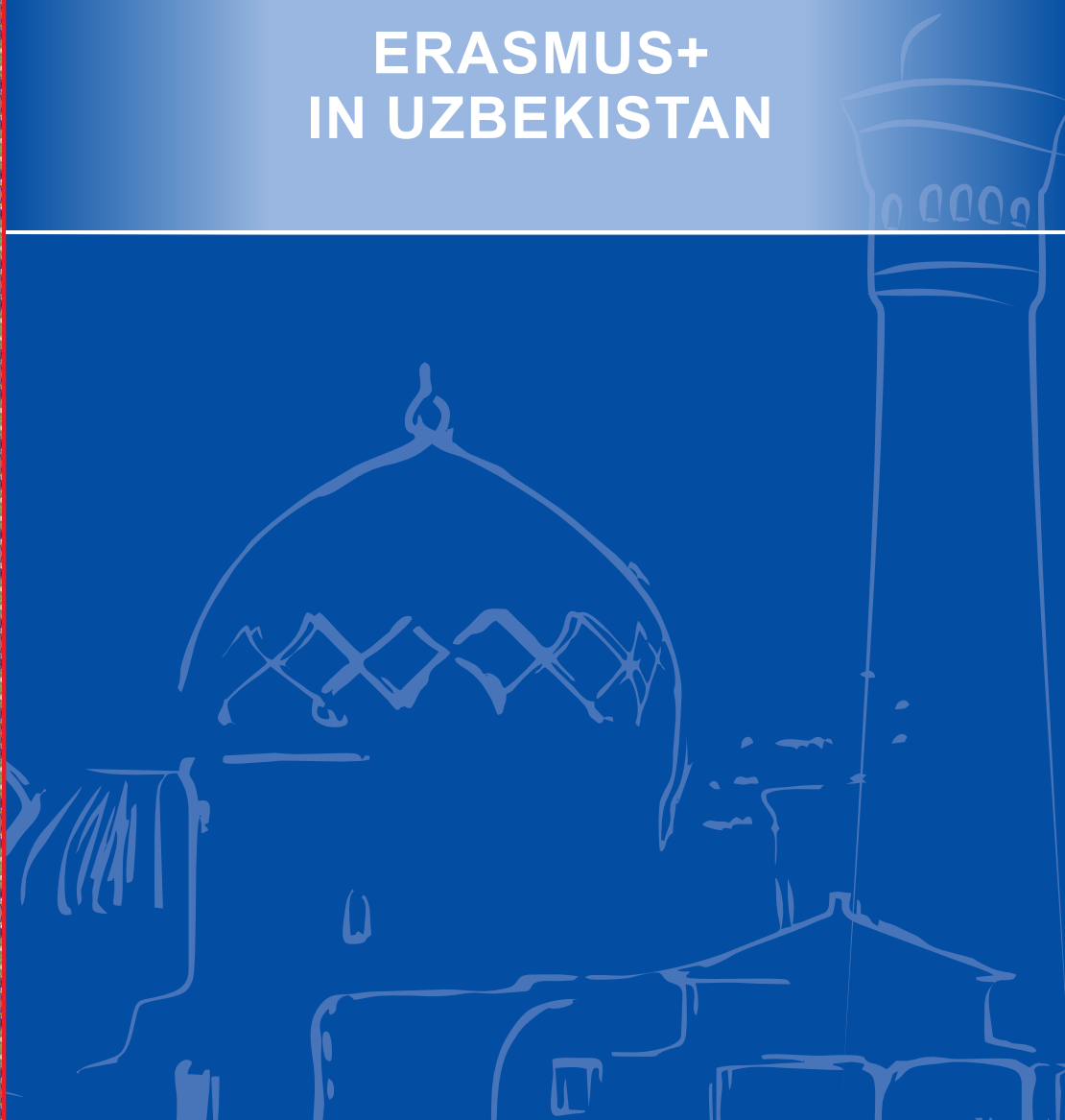




with the support of the
Erasmus+ Programme
of the European Union

ERASMUS+ IN UZBEKISTAN



Tashkent - 2021

Prepared by the National Erasmus+ Office in Uzbekistan

Financed by the Erasmus+ programme of the European Union

The conclusions and views expressed herein are those of the authors and do not necessarily reflect an official view of the European Commission

Ўзбекистондаги Erasmus+ миллий офиси томонидан тайёрланган

Бу нашр Европа Иттифоқининг Erasmus+ дастури

томонидан молиялаштирилган

Ушбу нашрда ақс эттирилган хулосалар Европа Комиссиясининг

фикрини ифода этмайди

Подготовлено Национальным офисом Erasmus+ в Узбекистане

Издание профинансировано программой Erasmus+ Европейского Союза

Выводы и заключения, содержащиеся в статьях, не отражают мнения

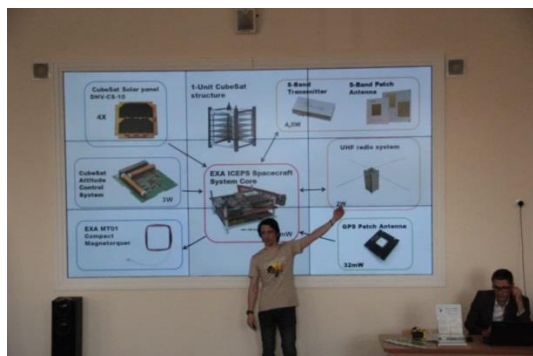
Европейской Комиссии

Table of contents

КИРИШ/INTRODUCTION/ВВЕДЕНИЕ	5
КРАТКОЕ СОДЕРЖАНИЕ ОТЧЕТА ПРОМЕЖУТОЧНОГО ИССЛЕДОВАНИЯ ВЛИЯНИЯ ПРОЕКТОВ ERASMUS+ ПО ПОВЫШЕНИЮ ПОТЕНЦИАЛА ВЫСШЕГО ОБРАЗОВАНИЯ НА РАЗВИТИЕ И МОДЕРНИЗАЦИЮ ВЫСШЕГО ОБРАЗОВАНИЯ РЕСПУБЛИКИ УЗБЕКИСТАН	8
III CALL OF ERASMUS+ 2017	
EVALUATION AND RESULTS OF THE DSINGIS PROJECT	13
ASSOCIATE PARTNERS AND BENEFICIARY ORGANIZATION ARE MAIN TARGET AIMS OF THE ERCA PROJECT	28
МАЛАКАЛИ КАДРЛАР ВА ЁШ МУТАХАССИСЛАРНИ ШАКЛЛАНТИРИШДА ЕВРОПА ИТТИФОҚИ ЭРАСМУС+ ТАЪЛИМ ДАСТУРИНИНГ РОЛИ “INTRAS” ЛОЙИХАСИ МИСОЛИДА	32
AN ILLUSTRATIVE VIEW OF THE PARTICIPATION TO THE CONFERENCES, EXHIBITIONS, WORKSHOPS AND SOME OTHER ACTIVITIES OF THE ERCA PROJECT MEMBERS	34
IV CALL OF ERASMUS+ 2018	
МОДЕРНИЗАЦИЯ МЕДИЦИНСКОГО ПОСТДИПЛОМНОГО ОБРАЗОВАНИЯ: АНАЛИЗ РЕАЛИЗАЦИИ ПРОЕКТА CHILDCA	42
SOME RESULTS OF THE ERASMUS+ CBHE UNICAC PROJECT REALIZATION AT TASHKENT UNIVERSITY OF INFORMATION TECHNOLOGIES	49
ERASMUS+ ДАСТУРИ ДОИРАСИДА ТАШКИЛ ҚИЛИНАДИГАН СЕМИНАР-ТРЕНИНГЛАРНИНГ АҲАМИЯТИ ХУСУСИДА (NICORA, SPACESOM)	52
V CALL OF ERASMUS+ 2019	
IMPORTANCE ROBOTICS AND MECHATRONICS TO INDUSTRY REVOLUTION	56
ФАРҒОНА ПОЛИТЕХНИКА ИНСТИТУТИДА “МЕЧНАУЗ” ЛОЙИХАСИ “МЕХАТРОНИКА ВА РОБОТОТЕХНИКА” ТАЪЛИМ ЙЎНАЛИШИНИНГ ОЧИЛИШИГА АСОС БЎЛДИ	61

Семинарнинг амалий қисмида лойиҳа иштирокчилари томонидан тайёрланган виртуал сунъий йўлдошнинг фазога парвози махсус дастурлар ёрдамида барча параметрларни ҳисобга олиб, моделлаштирилган ҳолда амалга оширилди ҳамда унинг орбитаси, учуш баландлиги, даврийлиги синовдан ўтказилди.

Семинар якунида қатнашувчилар томонидан берилган саволлари бўйича эркин мулоқот бўлиб ўтди.



А.Небесний ва М.Абдукаримовларнинг маърузаларидан лавҳалар.

08.04.2021 й. ЎЗМУ

Ташкил қилинган бундай семинар-тренингларнинг Ўзбекистон Республикаси олий таълим тизимининг ривожланишига ижобий таъсир кўрсатади. Бунда айниқса бакалаврият талабаларининг, магистрантлар ва таянч докторантларнинг иштирок этганлиги, шунингдек, семинар-тренинг маълумотлари асосида тайёрланган маърузалар орқали унинг университетда ёйилиши келгусида кичик сунъий йўлдошларни муайян мақсадлар учун ишлаб чиқиш, аниқ қишлоқ хўжалиги масалаларини ҳал қилишда улардан фойланиш соҳасини ривожланишига ёрдам беради.

IMPORTANCE ROBOTICS AND MECHATRONICS TO INDUSTRY REVOLUTION

U.R.Khamdamov, H.E.Khujamatov, D.T.Khasanov

**Tashkent university of information technologies named after
Muhammad
al-Khwarizmi**

e-mail: utkir.hamdamov@mail.ru, kh.khujamatov@gmail.com,
dhasanov0992@gmail.com

Annotation: Mechatronics and robotics quickly penetrated into all spheres of human activity, formed as a priority of scientific and technological development, entered the list of «important technologies» that determine the level of production, product competitiveness, quality of life. At the same time, mechatronic and robotic systems are widely used in the fields of machinery and equipment, automobiles, robotics and computer technology, as well as in industries such as railways, aerospace, medicine, office, military and home appliances. This article explores the basic concepts of robotics and mechatronics, its goals and objectives. The article also examines the role and impact of robotics and mechatronics in the industrial revolution.

Key words: mechatronics, robotics, industry 4.0, industrial revolution.

Аннотация: Мехатроника робототехника быстро проникла во все сферы деятельности человека, сформировалась как приоритет научно-технического развития, вошла в список «важных технологий», определяющих уровень производства, конкурентоспособность продукции, качество жизни. В то же время мехатронные и роботизированные системы широко используются в областях машин и оборудования, автомобилей, робототехники и компьютерных технологий, а также в таких отраслях, как железные дороги, аэрокосмическая промышленность, медицина, офис, военная и бытовая техника. В этой статье исследуются основные концепции робототехники и мехатроники, ее цели и задачи. В статье также исследуется роль и влияние робототехники и мехатроники в промышленной революции.

Ключевые слова: мехатроника, робототехника, индустрия 4.0, промышленная революция.

Annotatsiya: Mexatronika va robotatexnika qisqa vaqt ichida inson faoliyatining barcha sohalariga kirib bordi, fan va texnika taraqqiyotining ustuvor yo'nalishi sifatida shakllandi, ishlab chiqarish darajasini, mahsulot raqobatbardoshligini, hayot sifatini belgilaydigan "muhim texnologiyalar" ro'yxatiga kirdi. Shu bilan birga, mexatronik va robotatexnika tizimlar mashinasozlik va asbobsozlik sohalarida dastgohlar va avtomobillar, robototexnika va kompyuter texnologiyalari, shuningdek temir yo'l, aerokosmik, tibbiyot, ofis, harbiy va maishiy texnika kabi sohalarda, ya'ni sanoat sohasida keng qo'llanilmoqda. Ushbu maqolada Robotatexnika va mexatronikaning asosiy tushunchalari, uning maqsadi va vazifalari o'rganilgan. Shuningdek maqolad robotatexnika va mexatronikaning sanoat inqilobidagi ahamiyati hamda ta'siri tadqiq etilgan.

Kalit so'zlar: mexatronika, robotatexnika, sanoat 4.0, sanoat revolyutsiyasi.

Currently, mechatronics, along with informatics, bioengineering and nanotechnology, has a significant impact on the development of industrial and

household technospheres towards the increasingly widespread introduction of mechatronic automation and robotization systems into various physical and technical processes in all spheres of society.

The goal of mechatronics is to create intelligent physical and technical products, systems and processes that have qualitatively new functions, properties and capabilities. A special case of such physical and technical products are robots and robotic systems of various purposes and dimensions.

Modern mechatronics and robotics cover all dimensional scales of technical systems from «macro» to «micro» (sizes from 1 micron to 1 mm) with the subsequent transition from microsystems to Nano systems (about a hundred nanometers - 10^{-7} m): the transition «macro-micro -nano-mechatronics and -robotics».

Mechatronics is a field of science and technology based on the system integration of precision mechanics units, sensors of the state of the external environment and the object itself, energy sources, actuators, amplifiers, computing devices (computers and microprocessors). A mechatronic system is a single complex of electromechanical, electrohydraulic, electronic elements and computer technology, between which there is a constant dynamically changing exchange of energy and information, united by a common automatic control system with elements of artificial intelligence.

Robotics is a field of science and technology focused on the creation of robots and robotic systems based on mechatronic modules (information-sensor, executive and control). Robots and robotic systems are designed to perform work operations from micro to macro dimensions, including replacing a person for heavy, tedious and dangerous work.

The mechatronics method is based on a systemic combination (synergetic combination) of such previously isolated natural science and engineering areas as precision mechanics, microelectronics, electrical engineering, computer control and informatics at all stages of the product life cycle, starting with marketing and design and continuing at the stages of implementation (production), operation and disposal. The mechatronics method is based on synergistic integration (unification) of structural elements, technologies, energy and information flows to achieve a single goal. It's no secret that robotics has changed industries vastly since their introduction into manufacturing plants over the last eighty years. As the global manufacturing industry enters its fourth revolution, innovations such as robotics and mechatronics, automation and artificial intelligence (AI) are set to take over.

The number of active industrial robots worldwide is increasing by approximately 14% year on year, and automation continues to create new types of robots with improved utility and function.

Factories of the future will likely feature robots and humans working side-by-side to meet consumer demand - a new world which business owners should

be prepared for. It's important to gain an understanding of what is meant by 'the fourth revolution', or 'industry 4.0'.

The human race has collectively experienced three industrial revolutions since the 1800s; each revolution has been characterized by an exciting new technology that improved manufacturing and processes for the better. The steam engine, the assembly line, and the computer have each been the catalyst for prior revolutions.

Industry 4.0 refers to the current industrial revolution that we find ourselves in, led by the evolution of robotics, automation, and the internet of things (IoT). Industry 4.0 heralds an age of 'smart' systems and digital integration; the name was coined in 2011, and the associated movement is sending ripples through almost every industry around the globe.

Figure 1 below illustrates the revolutions of Industry 4.0. It shows that mechatronics and robotics form the basis of the latest industry 4.0.

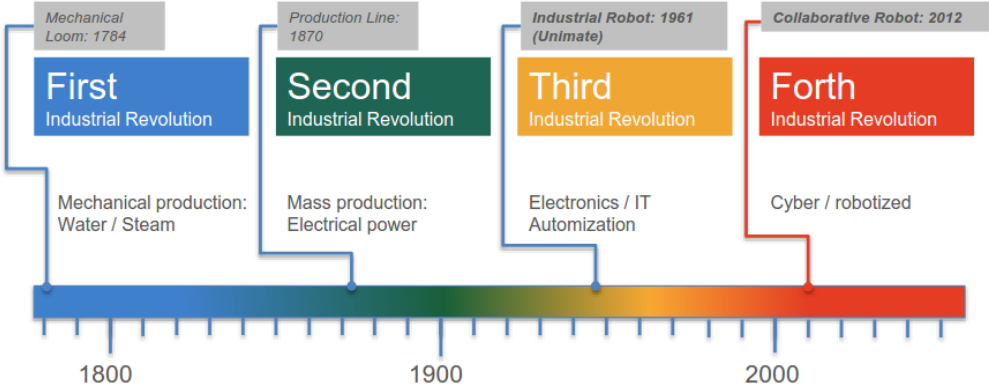


Fig. 1. Industrial revolution history

The development of robotics and mechatronics led to the recent industrial revolution. There are many reasons for this, but below are the 3 main effective ones are discussed.

1. Improve productivity. Based on current projections, AI is expected to have the ability to increase labour productivity by up to 40% by 2035.

Although some may see robotics and AI as tools to replace human workers, the International Federation of Robotics believes that less than 10% of jobs could be fully automated; robots are generally designed to take on repetitive tasks and allow workers to focus on more intensive duties. A major benefit of automation in large manufacturing operations is that some tasks could effectively be completed 24/7, thereby boosting production output without any additional labour costs.

Effective robotic completion of some tasks could be especially useful to small business owners. Small businesses generally cannot hire as large a workforce as manufacturing giants; automation may help to level the playing

field. In recent surveys, 57% of employers indicated an interest in boosting performance and productivity through automation and robotics. Some research has shown that increased use of AI in the workplace may actually create new job positions, allowing employers to hire more staff in the future.

2. Lower overhead costs. Although the initial cost of automated software or robots may be significant, the return on investment can be swift. Business owners might find that some roles are no longer required once AI is being utilized, saving costs immediately. As an example, some restaurant industry leaders are utilizing delivery robots, which reduces their need for human workers. With fewer employees taking part in hazardous work activities, businesses could also save on health and safety costs, with fewer injuries or time off work for their staff.

Many robots require only a small amount of space to operate, and can safely work alongside humans on assembly lines. The potential reduction in required space means that companies could also downsize to cheaper workplaces and factories. According to recent surveys, 24% of employers are currently considering automating some roles in order to reduce operating costs.

3. Reduce human error. Human error is a factor that every business must plan for, and time and energy are both spent rectifying the issues when they occur. Particularly when it comes to highly repetitive or mathematical tasks, automation could handle these with a far lower margin of error than human workers. As automation can be expensive to implement, it's critical that entrepreneurs take stock of their end-to-end processes, and decide where they can receive the biggest impact from AI.

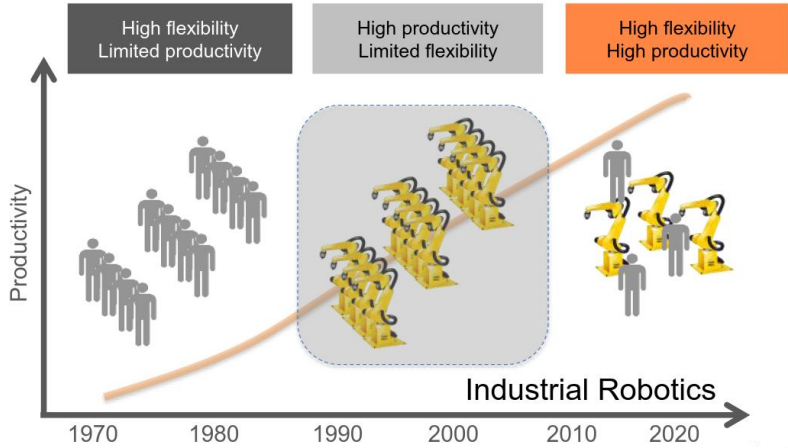


Fig. 2. Impact of robotics and mechatronics development to Industry productivity

Figure 2 clearly shows the impact of robotics and mechatronics on production efficiency. According to it, production without the intervention of robots and mechatronics has the lowest performance. In this case, production has high flexibility but limited productivity. If only robots are used in industry, on the

contrary, production efficiency will be high and flexibility will be limited. Therefore, production productivity and flexibility will be higher if human intervention is provided in the industry along with robotics and mechatronics. This underscores the importance of studying robotics and mechatronics in the educational process, training personnel and specialists in each industry.

References

1. «30 Automation Statistics For The New Decade», Source: <https://kommandotech.com/statistics/automation-statistics/>
2. «What Is The Fourth Industrial Revolution?», Source: <https://txm.com/what-is-the-fourth-industrial-revolution-industry-4-0/>
3. «What Is Industry 4.0». Source: <https://insights.sap.com/what-is-industry-4-0/>
4. «The Benefits Of Automation In Today’s Workforce», Source: <https://www.forbes.com/sites/forbestechcouncil/2020/05/01/the-benefits-of-automation-in-todays-workforce/?sh=20473ab41cc8>

ФАРҒОНА ПОЛИТЕХНИКА ИНСТИТУТИДА “МЕCHAUZ” ЛОЙИҲАСИ “МЕХАТРОНИКА ВА РОБОТОТЕХНИКА” ТАЪЛИМ ЙЎНАЛИШИНING ОЧИЛИШИГА АСОС БЎЛДИ

Мамуров Элдор Турсунович, Турсуналиев Исмоил Эсоналиевич,
Хусанов Юнусали Юлдашалиевич
Фарғона политехника институти
тел.: 90-560-98-60, e-mail: emamurov@mail.ru

Аннотация. Мақолада Фарғона политехника институтида MechaUz: “Ўзбекистонда “Мехатроника ва робототехника” бакалавриат таълим йўналишини инновацион ғоялар ва рақамли технологиялар асосида модернизация қилиш” лойиҳаси доирасида амалга оширилаётган ишлар ва эришилган натижалар ҳақида маълумот берилган.

Калит сўзлар: лойиҳа, мехатроника, технология, робототехника, инновация, адабиёт, машинасозлик, муҳандис, жамоа, лаборатория, жиҳоз, модернизация.

Мехатроника – механик воситаларни электрон, электротехник ва компьютер компонентлари билан бириктиришга асосланган янги модул, машина ва интеллектуал бошқарувли тизимларни лойиҳалаш ва ишлаб чиқишни таъминловчи фан ва техника соҳасидир. Бугунги кунда