COMPUTER TECHNOLOGIES OF AIRPORT CONSTRUCTION AND RECONSTRUCTION DEPARTMENT

Field of study: 19 “Architecture and Construction”

Specialty: 192 “Building and Civil Engineering”

Educational-Professional Program: “Industrial and Civil Engineering”

Educational-Professional Program: “Highways and Airfields”

Form of education: full-time

Language of education: Ukrainian and English (English-language project)

Training period

Bachelor degree 3 years 10 months

Master degree 1 year 4 months

Educational-Professional Program **“Industrial and Civil Engineering”**

Bachelor degree http://fgsa.nau.edu.ua/wp-content/uploads/2023/02/192-opp-bak-ktbra-ptsb-2021.pdf

Master degree http://fgsa.nau.edu.ua/wp-content/uploads/2023/02/192_opp_mag_ptsb-2021.pdf

Educational-Professional Program **“Highways and Airfields”**

Bachelor degree http://fgsa.nau.edu.ua/wp-content/uploads/2023/02/192-opp-bak-ktbra-ada-2021-1.pdf

Master degree http://fgsa.nau.edu.ua/wp-content/uploads/2023/02/192_opp_mag_ada-2021.pdf

Educational-Scientific Program **“Building and Civil Engineering” (PhD)**

http://fgsa.nau.edu.ua/wp-content/uploads/2023/02/192_onp_phd_budivnytstvo_ta_tsyvilna_inzheneriia-2021.pdf

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HISTORY OF THE DEPARTMENT

The Computer Technologies of Airport Construction and Reconstruction Department of was created on July 1, 2021 as a result of restructuring of NAU subdivisions by united the Department of Computer Technologies of Construction (founded in 1970 - the Department of Buildings and Construction of Airports) and the Department of Reconstruction of Airports and Highways (founded in 1969 - Department of Airports) in accordance with Order № 234/od of April 21, 2021. Computer Technologies of Airport Construction and Reconstruction Department has the status of a graduate department.

The Department was founded as part of the Airport Faculty in 1970. The department's activities were initiated in connection with the need to improve the quality of training of highly qualified construction specialists for civil aviation enterprises. The founder of the Department of Airport Buildings and Constructions was Doctor of Technical Sciences, Professor Mykola Antonovych Cherkasov (1921-1981). The founder of the Department of Airports, the first head was Doctor of Technical Sciences, Professor Blokhin Vitaly Ivanovych (1917-1991), under his scientific leadership, the development of documents and tactical and technical requirements for the design of new special military and civilian objects was carried

out; regulatory requirements for the construction and reconstruction of airfields, airports and their facilities were developed.

From 1981 to 1986, the Department was headed by candidate of technical sciences, associate professor Sotnichenko Borys Feodosiyovych.

From 1986 to 2010, the Department was headed by Doctor of Technical Sciences, full member of the Academy of Civil Engineering of Ukraine, Academy of Engineering Sciences of Ukraine, member of the National Committee for Theoretical and Applied Mechanics of Ukraine, Professor Veryuzhskyi Yuriy Vasyliovych. During this period, the department carried out scientific and research work related to technical inspections of construction objects, the Scientific and Research Institute of Rapid Construction Processes, headed by Y.V. Veryuzhskyi, worked. The Institute (SRIRCP) was established by order of the Minister of Education of Ukraine and the rector of KICAE (now NAU) in 1993. The main areas of research of the Research Institute of Mechanics of Rapid Processes were:

- research of the problems of the mechanics of fast-moving processes based on the design and development of theoretical, experimental, numerical and combined methods;

- performance of scientific research, project research and design work on the development of engineering and technical objects and technologies of mechanical engineering, construction, energy, transport, etc.;

- production, testing and introduction into industry of prototypes and specimens of new engineering and technical objects.

In order to internationalize education, since 1999, the Department has been started training bachelors, specialists and masters in the specialty “Industrial and Civil Engineering” in English. During this period, the first English-language project in Ukraine was founded on the basis of the Department. In 2003, the first graduation of the English-speaking group took place.

In 2002, the Department was renamed to the Department of Computer Technologies of Construction, as there was an urgent need to train specialists who

are competitive on the global labor market and possess innovative computer technologies of design and computer modeling.

From 2010-2011, the Department was headed by Professor Kolchunov Volodymyr Ivanovych, Doctor of Technical Sciences, full member of the Academy of Civil Engineering of Ukraine in the Department “Soil Mechanics, Bases and Foundations, Structures”. Scientists of the school “Mechanics of reinforced concrete” Kolchunova V.I. worked on the problems of calculation and design building constructions, buildings and structures.

Since 2011, the Department has been headed by Oleksandr Ivanovych Lapenko, Doctor of Technical Sciences, Professor, a valid member of the Civil Engineering Academy of Ukraine, specialist in the field of design and implementation of steel-reinforced concrete structures. He is the founder of a scientific school that deals with the design of steel and concrete joints by means of gluing for their joint operation in structures operating in complex conditions under heavy loads; head of the scientific direction “Reinforced concrete structures: development, design, implementation”.

From 2013 to 2023, the Department qualitatively improved its scientific and pedagogical composition, namely, 3 dissertations for obtaining the scientific degree of Doctor of Technical Sciences, 12 dissertations for obtaining the scientific degree of Candidate of Technical Sciences, and 1 dissertation for obtaining the scientific degree of Doctor of Philosophy under the Educational-Scientific Program “Building and Civil Engineering” were defended.

Due to the fact that there is a need for military specialists in the construction industry, since 2015 the Computer Technologies of Airport Construction and Reconstruction Department together with the Department of Military Training of NAU has been recruiting for the specialty “Building and Civil Engineering”. Students-cadets undergo training according to the programs of training officers of the Armed Forces, and also study disciplines from the training program in the field of construction.

The 50-year history of the Department is a winding path of development of scientific and technical thought in the field of domestic construction science and training of highly qualified personnel. Among the students of the Department there are scientists, talented designers, heads of industry, heads of leading state organizations and private firms.

The training of Bachelors in “Building and Civil Engineering” under the Educational-Professional Program “Highways and Airfields” was launched at the National Aviation University in 2016, but this was preceded by the accumulation of significant experience in the training of civil engineers for the aviation industry, starting in 1969, when it was established Department of Airports within the Faculty of Airports. Great merit in the creation of the Department and establishment of the scientific school of design and operation of airfields belongs to its first head, Doctor of Technical Sciences, Professor V.I. Blokhin and the team of teachers of the Department A.A. Domashevskyi, H.M. Reminets, I.A. Belinskyi (headed the Department in 1979), Yu.M. Kryvenko, B.F. Sotnychenko, V.S. Sukhobrus, I.V. Tsyprianovych, G.I. Bannih, V.G. Vakulenko, A.F. Dankevich. A significant event in the life of the Department was the opening of the ICAO training course “Technical operation of airfield surfaces and runways” for ICAO scholarship holders in 1989. The text of the lecture course was prepared and published in English by the Department. The Department's innovations also include the Development and introduction of computer training programs for airfield design into the educational process. An important milestone in the scientific work of the department was the implementation of scientific research works on the standardization of design and construction of airfields, which were implemented in building regulations “Airfields” in 1980 and 1985. The results of the research work of teachers and students were reflected in 14 protected candidate dissertations and more than 30 diplomas of industry and republican competitions. The activity of the Faculty of Airports is significant and shows significant achievements both in the training of engineering personnel for aviation, which is at least 2,000 specialists, and in

scientific activity, the results of which are relevant. 22 teachers defended their PhD theses. Graduates of the Faculty represent more than 30 countries.

In 2002, the Department of Reconstruction of Airports and Highways was created, and in 2021, the Computer Technologies of Airport Construction and Reconstruction Department was created by merging the Department of Reconstruction of Airports and Highways and the Department of Computer Technologies of Construction. The preparation was carried out taking into account the achievements of the world aviation industry, as well as the achievements of the world construction industry regarding the design, construction and operation of highways and airfields.

Therefore, Bachelor's training under the Educational-Professional Program “Highways and Airfields” consists in training a specialist who is able to solve complex non-standard tasks and problems of an engineering nature in the field of construction and civil engineering, who has modern computer design technologies, knowledge and skills of construction and operation highways and airfields.

In 2021, the working group of the Department of Reconstruction of Airports and Highways developed the second edition of the Educational-Professional Program “Highways and Airfields” in accordance with the standard of higher education in specialty 192 “Building and Civil Engineering” for the first (Bachelor's) level of higher education. In accordance with the second edition of the Educational-Professional Program “Highways and Airfields” selective components were formed taking into account the specifics of the content of the activities of future specialists, as well as involved scientific and pedagogical workers with relevant professional and scientific and pedagogical experience.

In January 2021, as a guarantor of the Educational-Professional Program “Highways and Airfields” Candidate of Technical Sciences, Senior Researcher T.Yu. Khimeryk, who had practical work experience related to the construction and operation of highways and airfields, was appointed. In 2022, Candidate of Technical Sciences, Associate Professor O.M. Dubyk was appointed as the guarantor of the Educational-Professional Program “Highways and Airfields”. In December 2022,

the procedure of annual review of the Educational-Professional Program was carried out in accordance with the order of the rector, taking into account the experience of its implementation, the wishes of the applicants and the advice of external stakeholders. In order to ensure the best possible opportunities for applicants to realize individual educational trajectories, the spectrum of variable recommended and alternative disciplines was updated in 2022. In order to restore the potential of the Faculty in the field of training specialists in the design, construction and operation of airfields, the management and the Academic Council of the National Aviation University took a number of measures to update the content of educational activities. According to the decision of the Academic Council of the National Aviation University, the Faculty of Architecture, Construction and Design has been renamed the Faculty of Ground Structures and Airfields since February 1, 2023. Ministry for Communities and Territories Development of Ukraine recognized the National Aviation University as the basic organization for standardization in construction, and the Faculty was given the opportunity to participate in competitions for the preparation of State Construction Norms and Standards. The scientists of the Faculty together with other specialists of the industry prepared the draft DBN B.2.3 “Transport structures. Airfields” to replace the building regulations “Airfields”, in the development of which the scientists of the faculty participated in 1980-1985.

SCIENCE

Today the Computer Technologies of Airport Construction and Reconstruction Department has 7 scientific schools that work in the areas of design, reconstruction and technical operation of industrial and civil buildings and structures, engineering structures of various functional purposes. Scientific and educational work at the Department is focused on modern computer technologies in industrial, civil and transport engineering, the Department trains specialists under Educational-Professional Program “Industrial and Civil Engineering”, “Highways and Airfields” specialty 192 “Building and Civil Engineering” fields of knowledge

19 “Architecture and Construction” of the first (Bachelor) and second (Master) level of higher education; of the third level of higher education (PhD) specialty 192 “Building and Civil Engineering”.

The directions of scientific research work of the Department are declared in the Regulations of the Department. According to the Regulations, it is advisable to link the development of the Department with the development of traditional areas of activity, which are based on conducting theoretical and experimental research based on modern methods of calculating building structures.

The main scientific direction of the Department's development is the development of the principles and latest technologies of design, calculation and reconstruction of buildings and engineering structures. It is advisable to develop the direction on the basis of the scientific research work of the Department in the following directions:

Educational-Professional Program “Industrial and Civil Engineering”

1. Steel-reinforced concrete structures: development, design, implementation (head of the department, Doctor of Technical Sciences, Prof. O. I. Lapenko, Doctor of Technical Sciences, Assoc. Prof. A.V. Makhinko, Doctor of Technical Sciences, Assoc. Prof. Makhinko N.O.). Development and implementation of new types of steel-reinforced concrete structures with determination of the actual stress-strain state in the practice of design and reconstruction of buildings and engineering structures.

2. Study of the problems of reconstruction of buildings and structures using the method of physical models of resistance (supervisor, Doctor of Technical Sciences, Prof. Yakovenko I. A.). Improvement of calculation methods of reinforced building structures using modern apparatus, which is based on complexes of experimental studies.

3. Mechanics of reinforced concrete (supervisor, Doctor of Technical Sciences, Prof. Yakovenko I.A., Candidate of Technical Sciences, K.V. Omelchenko). Stress-strain state, design and reconstruction of buildings and engineering structures.

4. BIM-technologies of modeling structures, alternative methods of creating calculation schemes; technological line of CAD design (Doctor of Technical Sciences, Prof. M.S. Barabash, assistant A.V. Tomashevskyi). Implementation of the latest computer software complexes and computer technologies for modeling extraordinary construction structures, buildings and structures using modern regulatory documents and methods; alternative methods of creating settlement schemes; technological line of design by means of CAD (LIRA-SAPR, MONOMAKH, ESPRI, SAPFIR, etc.).

5. Numerical methods in calculations of building structures (Candidate of Technical Sciences, Associate Professor S.M. Skrebneva, senior lecturer Mashkov I.L.). Implementation of modern calculation apparatus, which is based on numerical and analytical methods of calculation of construction structures, buildings and structures with extraordinary calculation schemes for static and dynamic effects.

6. Methods of examining the wear resistance of construction structures of industrial and civil buildings and structures (Candidate of Technical Sciences, Associate Professor N.O. Kostyra). Improvement of modern methods of surveying load-bearing structures of buildings and structures; determination of the actual stress-strain state; drawing up calculation schemes based on actual deviations and existing defects; providing recommendations regarding the possible further operation of the object of design or reconstruction.

7. Development of regulatory documents in the field of construction (head of the Department, Doctor of Technical Sciences, Prof. O.I. Lapenko, Doctor of Technical Sciences, Prof. Yakovenko I.A.). Master's students studying at the Educational-Professional Program “Industrial and Civil Engineering” and the Educational-Professional Program “Highways and Airfields” and post-graduate students (Educational-Scientific Program “Building and Civil Engineering”) engaged in their scientific training in the scientific circle corresponding to the name are involved in the scientific work directly.

Educational-Professional Program "Highways and Airfields"

1. The influence of the properties of asphalt concrete coatings with slag materials on the transport and operational indicators of highways (Candidate of Technical Sciences, Associate Professor Krayushkina K.V.).

2. Problems of design and calculation of airfield coatings (Candidate of Technical Sciences, Associate Professor O.V. Rodchenko, Candidate of Technical Sciences, Associate Professor O.M. Dubyk). Determination of the actual stress-strain state of rigid airfield coatings; development of modern software for calculation of airfield coverage taking into account dynamic influences.

3. Methodology of reconstruction of airport facilities in difficult engineering and geological conditions of Ukraine.

4. Methodology for designing structural models of conglomerates for airfield and road surfaces.

5. Maintenance of highways with cement concrete coating.

6. Study of the properties of fly ash, slag and ash-slag mixtures for their use in the road and airfield industries.

7. Solving the problems of the street and road network of Ukrainian cities based on the theory of risks using mathematical modeling methods (Doctor of Technical Sciences, Prof. Stepanchuk O.V.).

8. Development of the DBN project to replace the DBN V.2.3-5-2001 "Streets and roads of populated areas" (Doctor of Technical Sciences, Prof. Stepanchuk O.V.).

The graduate the Computer Technologies of Airport Construction and Reconstruction Department involves employers in the organization and implementation of the educational process, using their scientific and industrial potential during training sessions, for the joint implementation of research work, as well as the organization of internships for scientific and pedagogical workers. The Department develops various forms of cooperation with stakeholders, such as: joint work in the design and implementation of the educational program; reviewing the educational program and its periodic review; passing of industrial practices by

students; conducting scientific and practical seminars; permanent participation in state examination commissions; involvement in participation in international scientific and technical conferences, which discuss modern problems of the construction industry and ways to rationally solve them, the latest technologies and ways of their further improvement, as well as requirements for graduates' competencies; professional development of teachers, their participation in stakeholder events; scientific consulting by teachers and leading specialists of the Department.

Goals, features (uniqueness) of the Educational-Professional Program "Industrial and Civil Engineering"

The goal of training is to train specialists who are competitive on the global labor market, able to solve complex specialized tasks and practical issues in the field of construction and civil engineering based on a set of scientifically based methods of numerical modeling of the stress-strain state of structures; who possess innovative computer design technologies, knowledge and skills for the operation of construction objects, engineering systems and technological processes, computer modeling, methods of organizing production processes and fundamental and general engineering research.

The purpose of the educational program is to determine knowledge, abilities and skills, as well as educational components, teaching methods and program learning outcomes, which together form systemic professional competencies for design, construction, reconstruction and technical modernization or renovation of buildings and engineering structures, including those that support the aviation industry.

The uniqueness of the program lies in the formation of students of higher education in the ability to solve complex tasks of professional activity in the field of construction and civil engineering based on information modeling of buildings (BIM-technology).

Building information modeling (BIM) is a resource for presenting all characteristics of an object (physical and functional) in a digital format, which

allows to significantly increase the level of domestic construction, as well as improve the functioning of the construction industry of Ukraine.

Goals, features (uniqueness) of the Educational-Professional Program "Highways and Airfields"

The goal of education is the formation of the personality of a specialist, a competitive labor market, capable of solving complex non-standard tasks and problems of an engineering nature in the field of building and civil engineering, who possesses modern computer design technologies, knowledge and skills in the construction and operation of highways and airfields. Preparation of bachelors with wide access to employment.

The purpose of the educational program is to determine the knowledge, abilities and skills, as well as educational components, teaching methods and program learning outcomes, which together form systemic professional competencies for the design, construction and operation of highways and airfields.

The uniqueness of the educational program lies in the presence of specific components of the aviation component, namely: EC-18 - General planning of airports, EC-19 - Materials in road and airfield construction, EC-24 - Vertical planning of airfields, EC-40 - Course project on the discipline "General Planning of Airports", which are not found in similar (closer) educational programs of domestic institutions of higher education.

STRENGTHS OF THE ACTIVITY of the Computer Technologies of Airport Construction and Reconstruction Department of the Faculty of Ground Structures and Airfields

1. English language project. Future specialists have the opportunity to study in English - as a result, they get qualified training and can receive a special certificate along with a state-style diploma and continue their studies in any country in the world. The training is provided by the founder of the English-language project in construction and the only graduate department in Ukraine to date that provides the

opportunity to study in English under the Educational-Professional Program “Industrial and Civil Engineering”.

2. The feature (uniqueness) of the Educational-Professional Program “Industrial and Civil Engineering” consists in the formation of higher education students' ability to solve complex tasks of professional activity in the field of construction and civil engineering based on information modeling of buildings (BIM-technology).

3. Students receive high-quality computer training and knowledge of modern computer software complexes: “LIRApro”, “MONOMAKH”, “SAPFIR”, “AutoCAD”, “ArchiCAD”, “Allplan”, “MathCAD”, “MATLAB”, “MS Office”. The Department conducts training sessions using the computer base of LLC “LIRA-SAPR”, headed by the author of the development of software complex “LIRA-Pro”, Doctor of Technical Sciences, Prof. M.S. Barabash.

4. The meeting of the “Urban, industrial, civil and transport construction” section of the International scientific-practical conference of students and young scientists “Polit. Modern Problems of Science”.

5. Specialty 192 “Building and Civil Engineering” received special support from the state for Admission-2022 and previous years. Specialists in the construction industry are a necessary component for the restoration of infrastructure that has suffered damage and destruction as a result of military aggression.

6. The Department has a powerful scientific and pedagogical staff. Namely: 6 Doctors of Technical Sciences, of which 5 are Professors; 10 Candidates of Technical Sciences, 9 of them are Associate Professors.