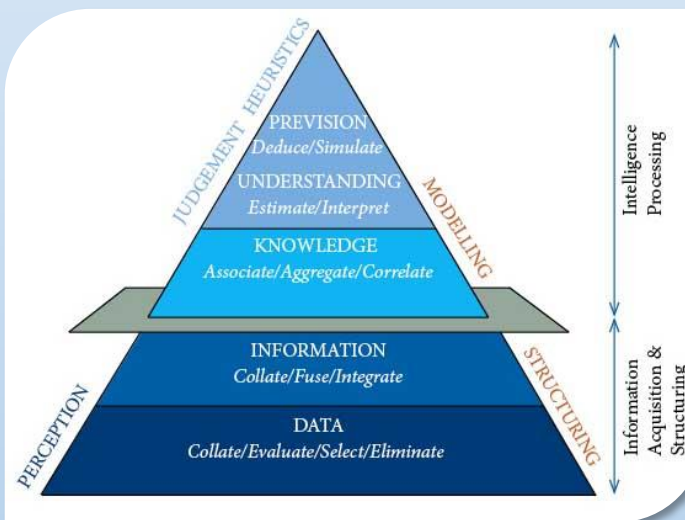«…Institute provides training of students on promising and relevant areas, which open up new opportunities in the labor market for young specialists-graduates...»

INFORMATION PACKAGE

EDUCATIONAL AND RESEARCH INSTITUTE FOR APPLIED SYSTEM ANALYSIS

Kyiv, 2023

CONTENT

*** *The information provided is current as of the 2023/2024 academic year.*

Please note that minor changes may occur in the list of training specialties and educational programs/specializations for the next academic year.

Foreign Economic Activity Office

+380 44 204 83 81
forea@kpi.ua
http://forea.kpi.ua/

Institute for Applied System Analysis
+380 44 204 81 45
+380 44 204 97 01
ipsa@kpi.ua
http://iasa.kpi.ua/

1. COMMON DESCRIPTION OF INSTITUTE

The leading role of information and computer-oriented scientific and production technology in the development of modern society, based on a combination of human intelligence, computer data processing, and their transmission through a computer network is well known. That is why the **Educational and Research Institute for Applied Systems Analysis (IASA)** provides training of students on promising and relevant areas, which open up new opportunities in the labor market for young specialists-graduates.

Institute for Applied Systems Analysis functions for over 20 years. **IASA** has more than 25 in-force agreements on cooperation with leading world universities and international organizations (EDNES, UNDP, WIPO, UICEE, IGIP, CODATA, ICSU, and others). Institute fulfills a leading role in many international projects and initiatives of the highest international level (UN, UNESCO, UNIDO, and others).

IASA provides interdisciplinary, systematic, and comprehensive training, harmonizing its efforts with the labor market. The training process takes into account not only the present but also the future state of development in science, technology, and production. IASA endeavors to create a focal point for innovative breakthroughs within the country by fostering collaboration between science, advanced education, and business, particularly in areas where IASA has strong expertise.

Graduates of the **IASA** are working in the positions of systems analysts, managers of information systems development, project managers, and engineers of computer systems and networks in public and commercial manufacturing enterprises, banks, and stock exchanges both in Ukraine and abroad.

The concept of the Institute's educational activities provides:

- the fundamentality of training;
- ensuring interdisciplinarity, consistency, the complexity of training, and harmonization of the Institute's activities with the labor market;
- expanding the presence of the Institute's scientific publications in the world's scientometric databases;
- combination of science, advanced education, and business;
- expansion of cooperation with partner institutions, development of academic mobility programs;
- implementation of the European model of academic freedoms.

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2. STRUCTURE

The IASA includes:

1. Department of Mathematical Methods of Systems Analysis;

2. Department of Systems Design

3. Department of Artificial Intelligence,

as well as

- **Research Center for Systems Research;**
- **Research (experimental) Laboratory of Intelligent Distributed Computing;**
- **Training Laboratory of Systems Analysis.**

3. EDUCATIONAL PROGRAMS

Levels of higher education. Training of students at the IASA is carried out at three levels of higher education.

At the first level (Bachelor's course, I-IV academic years) students acquire fundamental knowledge in physics, mathematics, mechanics, computing, informatics, and special disciplines. During the fourth year, they prepare and defend the bachelor's thesis and acquire a Bachelor's degree.

At the second level, (Master's course, I-II academic years) students acquire relevant professional skills including laboratory practice. Applicants prepare to defend a master's thesis and acquire a Master's degree.

The third educational-scientific level – postgraduate studies, I-IV academic years. Applicants defend their dissertations and they are awarded the educational qualification of Doctor of Philosophy (PhD).

Terms of training: Bachelor – 4 years; Master (education-professional program) – 1.5 years; Master (education-scientific program) – 2 years; PhD – 4 years.

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1. Department of Mathematical Methods of System Analysis provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
124 System Analysis	System Analysis and Control	Bachelor EPP	Master EPP	–
	Systems Analysis of Financial Market	–	Master EPP	–
	System Analysis	–	–	PhD

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

The department trains experts in the areas of system analysis and intelligent decision-making systems, which are capable of designing, building, and maintaining computer systems for analysis, forecasting, control, and design of dynamic processes in the macroeconomic, technical, technological, environmental, and financial objects.

2. Department of System Design provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
122 Computer Science	Intellectual Service-Oriented Distributed Computing	Bachelor EPP	Master EPP	–
	Computer Science	–	Master ESP	PhD

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

The department prepares experts in the following fields:

- Computational theory and methods of computer realization and distributed computing environment;
- Programming language theory and data stores;
- Design, development, integration, and maintenance of cloud systems, complexes, and environments for high-performance data processing and computer-aided

design based on parallel and distributed architectures, neural networks, and knowledge extraction and processing models in distributed computing environments.

3. Department of Artificial Intelligence provides training under the following Educational Programs:

Specialty	Educational Program	Levels of higher education		
		First	Second	Third
122 Computer Science	Systems and Methods of Artificial Intelligence	Bachelor EPP	Master EPP	–
	Computer Science	–	–	PhD

Comment: EPP – Educational-Professional Program
ESP – Educational-Scientific Program

On July 01, 2022, a new structural subdivision was founded at the ER IASA - the Department of Artificial Intelligence, which carries out educational, methodological and scientific activities in the specialty 122 "Computer Science".

The Department of Artificial Intelligence is focused on providing students with a thorough system of knowledge and training of professionals in accordance with modern trends in the field of artificial intelligence. The main goal of the department is to train professionals capable of developing, implementing and maintaining intelligent decision-making systems and data analysis and processing systems in organizational, technical, financial, natural systems; performing research, production, technical, organizational and managerial activities in artificial intelligence systems and technologies and large databases and their application in image and speech recognition systems and machine learning.

The educational programs of the Department of Artificial Intelligence are unique and innovative, as they involve the training of applicants in cooperation with leading employers in the field of information technology specializing in artificial intelligence research. This enables students to study in an environment that is close to a real production environment, and employers to get graduates who meet all their requirements.

The uniqueness of the educational programs is the combination of theoretical knowledge, formed and developed in the relevant scientific schools and reflected in the educational component of training, with practical skills supported by the WDC-Ukraine, Kyiv Polytechnic Science Park and the Institute of IASA. Not only teachers, but also

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qualified mentors from employer organizations help students to perform advanced research tasks in accordance with the agreed educational and research programs.

7 Reasons to choose the field of artificial intelligence

- IASA is a leading institute in the structure of Igor Sikorsky Kyiv Polytechnic Institute, the largest technical university in the country with more than 100 years of tradition.

- Highly qualified teaching staff.

- Modern information and educational space, including the capabilities of the World Data Center for Geoinformatics and Sustainable Development.

- Unique student environment and real conditions for the realization of your personality.

- Artificial intelligence will radically change the working and living conditions of people.

- The knowledge and skills you acquire will allow you to realize your abilities to apply artificial intelligence in areas such as smart robots and smart homes, digital assistants, autonomous vehicles, social media, the financial sector, and more.

- A wide range of employment opportunities in leading organizations in Ukraine and abroad.

Research Center for Systems Research has the following main tasks:

- Research in the field of interdisciplinary systemic problems in the context of conflicting goals, uncertainties of various nature and multifactorial risks;

- Involvement of participants in the educational process in scientific, innovative international activities of the institute;

- The use of research results in the educational process in scientific and innovative activities of the institute.

Research (Experimental) Laboratory of Intelligent Distributed Computing has the following main tasks:

- Research in the field of service-oriented architecture in the processing of large amounts of data, microservice architecture in mathematical modeling, intelligent decision support systems, and blockchain technology in the implementation of virtual learning environments;

- Involvement of participants in the educational process in scientific, innovative international activities of the institute;

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- The use of research results in the educational process in scientific and innovative activities of the institute.

Training Laboratory of Systems Analysis:

- Ensures the activities of laboratories in the preparation and conducting of laboratory and practical classes in classrooms and laboratories following the schedule;

- Provides accounting, preservation, updating, and replenishment of training facilities;

- Monitors the proper condition of workplaces, equipment, devices, and computer equipment;

- Provides technical support during laboratory classes;

- Participates in the design of textbooks and methodological support of laboratory work;

- Provides technical and advisory assistance to applicants for higher education.

4. TRAINING AND LABORATORY BASE

IASA is fully provided with facilities for training. The following laboratories operate at the **IASA**:

- Regional Network Academy CISCO – Igor Sikorsky KPI IASA

- Sap University Alliance Program

- SAS Global Academic Program

- Educational Research Laboratory for IC Design «Melexis-KPI"

- Training and Research Laboratory IASA - EPAM Systems

- Training and Research Laboratory IASA – MERATECH

- IASA Laboratory of Digital Signal Processing

All the laboratories are equipped according to modern principles of computer labs. The best conditions are provided for practical training, in particular for training courses CISCO Networking Academy for design, construction, and administration of local and global networks, as well as many areas related to the analytical support of banking activities, etc.

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5. RESEARCH ACTIVITY

The main tasks of the scientific activity of the Institute are:

- Conducting basic and applied research in relevant areas of science and technology in order to obtain new scientific knowledge and their use for practical purposes.

- Conducting scientific and technical (experimental) developments based on scientific knowledge obtained from research or practical experience, in order to bring such knowledge to the stage of practical use.

- Provision of scientific and technical services.

- Conducting scientific and scientific-technical examination.

The main directions of scientific work of **IASA** (subordinate to the Ministry of Education and Science of Ukraine and the National Academy of Sciences of Ukraine are

Direction No1: Development of the system analysis methodology, methods, and means of the system mathematics for solving large-scale interdisciplinary tasks in various fields of the national economy

Direction No2: Development of the theory of nonlinear and multidigit analysis, nonlinear differential operator equations, and variational inclusions inequations, infinite-dimensional analysis methods, theories and methods of optimization, game theory, systems of mathematics

Direction No3: Development of theoretical and applied foundations of global modeling of continuous development processes and evaluation of aggregate principal threats to the safety and quality of life within the framework of the World Data Center "Geoinformatics and Sustainable Development" and the international cooperation of the World's Data System.

Direction No4: Development of theory and instrumental tools of service-oriented computations for creation and maintenance of applied support by composition and control of certain services, development and implementation of the service-oriented interdisciplinary platform of engineering collaborative design in grid/cloud environment. It is a realization of the dream of the programming industry to replace "manual" coding of programs "from and to" by "industrial" build of applications from "standard accessories", as happens in the automotive or other "traditional" industries. Program components in the form of services can be hosted on different nodes of a distributed network and represent independent, loosely connected, replacement services-applications with unified interfaces.

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Department of Mathematical Methods of System Analysis

Research and training are carried out in the frameworks of 3 scientific schools of the department. Creative achievements of scientific schools are reflected in scientific innovation and scientific and methodological activities, the preparation of highly qualified scientific personnel.

Scientific schools of the department:

- System analysis and decision-making theory

- Methods and systems of computational intelligence

- Methods of processing and mining of great volumes of data of various nature in the management of projects for sustainable development.

The main directions of scientific activity:

- Development of principles and methods of system analysis;

- Applied research in the field of system analysis;

- Analysis and design of complex information systems;

- Forecasting of public issues;

- Systemic research in the field of global change;

- Implementation of wide-range international relations in the sphere of education and science.

Department of Systems Design

Research work at the Department of System Design is carried out within the framework of the scientific school "Computer service-oriented design in a distributed information environment". As a result of the performed research, a new methodology for the construction of the distributed architecture of problem-oriented software for solving challenging scientific and technical problems was created. Unlike existing approaches, it allows you to dynamically synthesize application software from available online software accessible through the web services interface (both SOAP services and REST services), and the involvement of high-performance computing resources as a grid network, and from cloud infrastructures to meet the specific tasks and requirements of the non-IT end-user.

The main directions of scientific activity of the Department of Systems Design include:

- Development and application of service-oriented and parallel computing and architectures (SOA and SOC), distributed grids - cloud, foggy (peripheral), and serverless computing;

- The use of advanced computing intelligence and neural networks deep learning, mining, and semantic and blockchain technologies in Big Data Mining and Computer-Aided Design;

- Construction of multi-agent systems and infrastructures as services (IaaS), platforms as services (PaaS), software as services (SaaS), data as services (DaaS) for digitalization of society;

- The use of SOCs and SOAs in creating applications for the Internet of Things, Smart Cities, Intelligent Transport, eHealth, and European Open Science Cloud (EOSC) applications.

Department of Artificial Intelligence

The department carries out scientific activities in the field of development of methods and tools of artificial intelligence for solving a number of theoretical and practical problems.

The scientific process is organized in such a way that it involves all parts of the department's functioning - from the educational process of bachelors (through their involvement in scientific circles and practical tasks) to the preparation of doctoral dissertations and works for obtaining a PhD. Under the leadership of the department's head, the research team is engaged in both theoretical work on neural networks, knowledge bases, intelligent agents, etc. and their application in medicine, agriculture, analytics, and other areas.

The members of the department successfully combine their research interests with teaching, encouraging students to get involved in solving interesting and relevant scientific problems.

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6. INTERNATIONAL PROJECTS AND COLLABORATION

Institute for Applied System Analysis collaborates on the terms and conditions of the signed agreements and contracts with the following universities:

- UNESCO International Centre for Engineering Education (UICEE) (Melbourne, Australia)
- Austro-Ukrainian Institute for Science and Technology (Vienna, Austria)
- Vienna University of Technology (Vienna, Austria)
- University of Bristol (Bristol, England)
- Liège Institute of Mathematics (Liege, Belgium)
- Budapest University of Technology and Economics (Budapest, Hungary)
- Otto von Guericke University Magdeburg (Magdeburg, Germany)
- Fraunhofer Institute for Integrated Circuits IIS (Dresden, Germany)
- Institute for Semiconductor Physics (Frankfurt an der Oder, Germany)
- Berlin Institute of Technology (Germany)
- Institute of Bioinformatics and Systems Biology (Munich, Germany)
- University of Indianapolis (Athens, Greece)
- Akaki Tsereteli State University (Kutaisi, Georgia)
- Technical University of Denmark (Lyngby, Denmark)
- University of Dublin (Dublin, Ireland)
- University of Alicante (Alicante, Spain)
- University of Barcelona (Barcelona, Spain)
- University of Valencia (Valencia, Spain)
- CEU Cardenal Herrera University (Elche, Spain)
- University of Murcia (Murcia, Spain)
- University of Seville (Seville, Spain)
- Polytechnic University of Turin (Turin, Italy)
- University of Trento (Trento, Italy)
- University of Naples Federico II (Naples, Italy))
- University of Salerno (Salerno, Italy))
- Sapienza University of Rome, (Rome, Italy))
- Chinese University of Hong Kong (Hong Kong, China)
- Central South University (Changsha, China)
- Eindhoven University of Technology (Eindhoven, Netherlands)

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- Wrocław University of Technology (Wroclaw, Poland)
- Lodz University of Technology (Lodz, Poland)
- University of Mining and Metallurgy (Krakow, Poland)
- AGH University of Science and Technology (Krakow, Poland)
- University of California Berkeley (, USA)
- University of California Santa Barbara (Santa Barbara, USA)
- Michigan State University (Lansing, USA)
- University of Michigan (Ann Arbor, USA)
- University of California Irvine (Irvine, USA)
- Tampere University of Technology (Tampere, Finland)
- University of Helsinki (Helsinki, Finland)
- Ecole Polytechnique (Paris, France)
- College International de Cannes (Cannes, France)
- Institute of Space and Telecommunications Law (Paris, France)
- Joseph Fourier University (Grenoble, France)
- Paris Institute of Technology (Paris, France)
- Czech Technical University in Prague (Prague, Czech Republic)
- CERN (Geneva, Switzerland)
- Tallinn University of Technology (Tallinn, Estonia)
- Pohang University of Science and Technology (Pohang, South Korea)
- Korea Institute of Science and Technology (Seoul, South Korea)

Teachers and students of the **IASA** are cooperating with many international organizations, and domestic and foreign companies in the field of education and research (Innovation for High Performance, Intel company, Central-East European Institute for Sustainable Development, Council for Science Technology of Ukraine, firms EUROPRACTICE (England), SPIRE (USA), SAMSUNG (Korea), and HUAWEI/

World Data Center of Geoinformatics and Sustainable Development was established in 2006 as a branch of the World Data Centers of Solar-Terrestrial Physics and Solid Earth Data

Under the EU program, Erasmus+ **IASA** carries out the educational exchange and academic mobility programs with leading educational institutions in France, Germany, Spain, the United Kingdom, the Netherlands, and Hungary.

7. CONTACT INFORMATION

Address: 37, Beresteiskyi Prospect, Ed. Building 35, Kyiv, Ukraine, 03056
E-mail: ipsa@kpi.ua; Kasyanov@i.ua .
Official website: http://www.iasa.kpi.ua/

Research Adviser: Doctor of Technical Sciences, Prof., Academician of NASU
Mykhailo Z. Zgurovsky,

Deputy Director of the Institute: Doctor of Physico-Mathematical Sciences,
Prof. Pavlo O.Kasyanov

Tel.:+38 (044) 204-81-45

1. Department of Mathematical Methods of System Analysis
Tel.: +380 44 204-80-97, +380 44 204 83 59
Official website: http://mmsa.kpi.ua

2. Department of System Design
+380 44 204 90 46
Official website: http://cad.kpi.ua/

3. Department of Artificial Intelligence
Tel.: +380 44 204 99 19
E-mail: 2049919@gmail.com
Official website: https://ai.kpi.ua/

Foreign Economic Activity Office

+380 44 204 83 81
forea@kpi.ua
http://forea.kpi.ua/

Institute for Applied System Analysis
+380 44 204 81 45
+380 44 204 97 01
ipsa@kpi.ua
http://iasa.kpi.ua/

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