Master evaluation report for EUR-ACE© label

National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

KPI

Panel members
Ms. Isabelle AVENAS-PAYAN - CTI Panel chair, Industry expert
Mr. Mohamed RAMDANI - CTI co-chair, Academic expert
Mr. Oleksandr VELIHORSKYI – NAQA, Academic expert
Mr. Constantin VERTAN – ARACIS, Academic expert
Mr. Stefanut BUHUS – ARACIS, Student expert

Presented at the plenary session of March 13th 2024

Name:	**National Technical University of Ukraine**
	Igor Sikorsky Kyiv Polytechnic Institute
Acronym:	KPI
Type:	Higher Education Institution, Public
Headquarters:	Kiev, Ukraine

CTI evaluation campaign: 2023-2024
European EUR-ACE© label

Scope of the application for the EUR-ACE© Label

Category	Programme
Category NEU (First-time application for the European EUR-ACE© label)	Master's degree in Acoustic Electronic Systems and Acoustic Information Processing Technology (AESAIPT)
Category NEU (First-time application for the European EUR-ACE© label)	Master's degree in Electronic Systems of Multimedia and Internet of Things Technology (ESMIoTT)

Presentation of the evaluated institution

The National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (KPI) is one of the largest universities not only in Ukraine, but in Europe. It ranks 4% of the best universities of the world according to the international QS World University Rankings and Webometrics.

It was created in August 1898 as the Kyiv Polytechnic Institute of Emperor Alexander II. It took its present name in 2016, as Igor Ivanovich Sikorsky was a former student and a Russian-American pioneer in both helicopters and fixed-wing aircraft.

Its visions are to contribute to the society based on sustainable development concepts; to be a technical research-led university; to create all conditions for training highly qualified specialists able to generate modern scientific knowledge and innovation technologies for the benefit of people and ensure a decent place of Ukraine in the world community.

KPI trains 25.000 students, postgraduates, doctorates as well as foreign students from neighbouring or far abroad countries. Every sixth student in the city of Kyiv is in an educational program at KPI and every 25th professor and associate professor in Ukraine is a fellow worker of KPI. Among all technical higher educational establishments in the Ukraine, every fifth faculty and chair is a faculty or chair of KPI.

The University has 14 faculties, 11 educational and scientific institutions, several scientific and research institutes, and educational centres. It trains Bachelors, Specialists and Masters, PhD and Doctors of Science. The university has its own publishing house "Polytechnika". It employs more than 500 professors and over 1300 associate professors.

KPI cooperates with technical universities of dozens of foreign countries and a lot of international organisations (UNESCO, UNIDO, WIPO, NATO, EDNES, ICSU, CODATA, etc.). The most leading corporations and firms (Siemens, Festo, Samsung, INTEL, etc.) take part in educational, scientific projects and programs.

All classrooms and laboratories are equipped with modern facilities and computer network educational technologies are being implemented in order to provide a qualified education that meets the requirements of a quality education.

Institutes and faculties as well as student housing lie within the university campus that occupies approximately 120 hectares in the centre of Kyiv city. The university has its own Centre of culture and art, modern sport complex, four sport and recreation bases. Its scientific and technical library is considered as one of the best in Ukraine.

Its missions are to make a significant contribution to sustainable development of the society through internationalisation and integration of education, research, and innovation development; to provide conditions for all professional, intellectual, social and creative development at the highest level of excellence in education and research area.

KPI holds the State polytechnic museum, one of the largest Ukrainian museums of technology and equipment, and the largest university museum of Ukraine. On campus, there is a monument that remembers famous graduates, scientists whose lives related to KPI.

Master's degree in Acoustic Electronic Systems and Acoustic Information Processing Technology (AESAIPT)

1. Programme aims

1.1   Educational needs of the labour market and other stakeholders

KPI maintains close cooperation with employers and stakeholders, having established agreements in acoustics and electronics with several companies, like "Ultracon-Service" LLC, "Ajax Systems Scientific and Production Enterprise" LLC, "Kyiv Scientific Research Institute of Hydro Devices" LLC, "MAG Audio" LLC, and the "AURORA" Hearing Rehabilitation Medical Center.

These employers have provided feedback on the educational programme (EP) project, which was incorporated into the programme, specifying several professional competencies. Letters of support and comments about the programme were sent to the Institute in 2021. The propositions are mainly related to the use of modern information resources, of modern electronic and acoustic systems, and of modern methods.

Employer representatives are involved in reviewing and updating the content of the educational programme and its components.

Industry representatives offer internships for master students and hold meetings and events within the institute. Nevertheless, no number of expected students is given by the companies in their support letters.

1.2   Programme Aims

The programme is in line with the development strategy of the university that is described in a document written in Ukrainian only. The educational programme aims at training electronics specialists to handle complex tasks in designing, producing, operating, maintaining, repairing, and modernizing acoustic electronic systems.

It is distinctive for its blend of electronics and acoustics, providing students with specialized knowledge in modern technologies for processing and protecting acoustic information. It covers areas like electroacoustic devices and systems, acoustic antennas, acoustic non-destructive testing, medical acoustics, hydroacoustics, architectural acoustics, and acoustic ecology.

Targeted graduate employment is mainly in electronics and telecommunications. Graduates may continue their studies at a doctorate level.

Programme competencies include 8 common competencies and 12 professional competencies. These competencies have been mentioned by at least 3 companies: Ajax Systems, MAG Audio, and AURORA.

The educational programme comprises two main parts: normative educational components (67 ECTS) and elective components (23 ECTS). The normative educational components are divided into a general training cycle and a vocational cycle. The duration of the educational programme is of 16 months.

1.3 Programme outcomes

The educational programme established 16 learning outcomes. Each programme outcome defines a professional skill. A matrix provides connections between programme learning outcomes and relevant components of the educational programme, that are normative courses of the general and the vocational training cycles.

The educational content aligns with the Ukrainian higher educational standard on specialty 171 (Electronics), focusing on the basic physical processes and phenomena that underlie the functioning of electronic devices and systems. This includes electroacoustic energy conversion, primary and secondary information conversion systems. It covers processes and systems for collecting, storing, protecting, processing, and transmitting acoustic information.

Creating acoustic electronic devices and systems, processing information with general and applied software tools seems to be the differentiating elements for this educational programme.

Synthetic analysis - Programme Aims

Strengths
- Strong and diverse partnership with companies;
- Solid theorical approach of the education process.

Weaknesses
- Companies did not specify the number of internships they are ready to offer for the programme.

Opportunities
- International partnerships.

Threats
- Decrease of the number of applicants.

2. Teaching and Learning Process

2.1 Teaching and Learning Process

The Master's degree in Acoustic electronic systems and acoustic information processing technology has two core programme documents: the so-called "Educational professional programme" (including the description of the programme with learning outcomes, the list of components, the description of final certifications, the matrix of correspondence between competences and components of the programme, the matrix of correspondence between learning outcomes and components of the programme); and the curriculum (including the schedule of the educational process, the list of components, the number of credits, the number of contact hours, the type of exams). The two documents are formally approved by the higher education institution (HEI), following internal regulations: developed by the project team headed by a project team leader, agreed by the scientific and methodological commission of specialty at KPI, and further by the methodological council of KPI, and finally approved by the academic council of the university and entered into force by the order of the Rector. The dates of formal approvals are prior to the starting of the programme.

The programme follows the standard of Ukrainian higher education for master's level for specialty 171 "Electronics": the global number of ECTS for the programme, the list of programme competencies and learning outcomes consist of all programme competencies and learning outcomes from the standard, the number of ECTS for practice (in the programme it is at 14 and standard requirements are at least 10), the form of final certification of students, defence of the final qualification work (master theses), etc.

The programme consists of the following parts:
1. General training cycle (11 ECTS), consisting of courses "Intellectual property and patenting", "Fundamentals of engineering and technologies of sustainable development", "Practical course on foreign language professional communication", "Startup projects marketing". These courses are unified at university level, and the content is common for all master's programmes in the faculty of electronics.
2. Vocational training cycle (22,5 ECTS), consisting of the following courses:
- "*Acoustic information systems*" – methods and means of acoustic measurements (e.g. distance, speed, and coordinates measurements), information theory, modulations etc. Laboratory works are based on MATLAB software that is used to simulate and investigate signals;
- "*Acoustic antennas*" is focused on the methods of forming acoustic waves and investigation of the acoustic antenna parameters;
- "*Computer processing of acoustic signals*" is focused on signal processing for the acoustic systems. MATLAB software is also used in the practicum.
- "*Electroacoustic equipment*" provides the students competencies of designing and mathematical description of electroacoustic systems, including filters, transmitters, and receivers. Software SolidWorks and MATLAB are used for the design and simulation of electroacoustic transmitters.
3. Research (scientific) component (33,5 ECTS), consisting of the courses "Scientific work on the topic of master's thesis", "Practice" and "Master's thesis". The topic and content of master thesis were analysed by the evaluation team. It is established, that they address the design, simulation, and experimental investigations of acoustic-electric devices, such as thermal analysis in SolidWorks software and Multiphysics analysis in COMSOL Multiphysics. Students use electronic laboratory equipment for measuring frequency characteristics of such devices. Some works are focused on speech processing and recognition with an implementation on microcontrollers. In general, works correspond to research and innovative approaches, which is required by the standard of higher education for the master's level.

4. Elective courses (23 ECTS).

Elective courses aim to improve the competencies of the students in acoustic systems design and simulation, or in the field of hardware-software security systems (including sensors, development of hardware and software parts).

The curriculum of the programme embeds a student-centred learning and teaching approach and enables flexible learning paths through a set of elective courses. It encourages students to take an active role in co-creating the learning process and forms individual educational trajectory.

2.2 Assessment of students' learning

The university uses a 100-point scaling grade for the assessment of students' learning, that further can be transformed into ECTS grade (A, B, C, D, E, FX, and F), and to national scale (excellent, good, satisfactory, or failed). All courses in the syllabus have clear explanations about assessments of learning outcomes, the number of points for each part of the course, for example: assessment of laboratory work, practical tasks, homework, etc.

Regulations on the evaluation of learning outcomes is very well documented. The document describes several types of control: current control (a type of ongoing control); calendar control for each discipline at fixed dates; semester control, detailed in the syllabus of each discipline, assessing exams or credits.

The programme consists of components and courses, each of which has a final control in the form of an exam, a final test, or defence of the master's thesis. Considering that the educational process has been provided in an online format since the COVID-19 outbreak (2020) and the war in Ukraine (2022), all assessments also have an online format. The students explained, during the meetings with the evaluation team, that there are formal procedures during exams – the web-camera should be always on during the assessments, ID card with the photo of the student should be shown at the beginning of the assessment, and the answers should be handwritten on the paper and discussed later with the professor that holds the course.

Each component of the educational programme lists the types of control and the rating system of evaluation that are used for its assessment.

2.3 Planning of the learning process

The programme has a clear calendar of the educational process that is included in the curriculum. The programme consists of 3 semesters, with a total duration of 1 year and 4 months. The first and the second semesters have both 18 weeks of lectures, practice, and lab exercises, and 2 weeks of examinations. The third semester consists of 8 weeks of practice, 9 weeks of research, and 1 week for the assessment of master's theses. The number of weeks in each semester is sufficient for achieving the learning outcomes, as described in the programme description.

The timetable is accessible online via a special [website](#) that is convenient for students and academic staff.

2.4 Management of the learning process

KPI provided the examination results lists for the course project in "Acoustic antennas" and final master's theses defence.

It should be mentioned that a majority of the master's theses was assessed as "excellent" and "very good" (around 62% and 23% of students in 2021-2022 study year, respectively), whereas the number of works assessed on lower points is much reduced. It contradicts the results of study in other courses. For example, the distribution of scores for the course

project is close to a normal distribution with a maximum of "very good" and "good". The management of the learning process should check the adequacy of the assessments or possibly change the complexity of the tasks for the master theses.

Teaching and learning process are supposed to be regularly evaluated, including feedback loops from students and academic staff. These evaluations are conducted by the Educational and Scientific Centre of Applied Sociology "Sotsioplus", using polls. Students regularly answer a survey for the evaluation of the quality of their training. The results reveal the level of achievement of learning outcomes for students. Feedback from academic staff and students are submitted by online questionnaires connected to the "Electronic campus" system at the end of each semester. Yet, there is a lack of information on how these polls and questionnaires are used: the number of answers is not specified; is there a feedback to academic staff and students?; how are the results of the surveys used for changing the programme content, courses, modules, complexity of individual tasks, procedures of assessment?; etc.

The composition of thesis juries does not include any representative of business or research institutions. It is too bad because these representatives might give interesting feedback on the programme.

Synthetic analysis - Teaching and Learning Process

Strengths
- Good organisation of the educational process and a wide variety of online tools.

Weaknesses
- The results of thesis assessment are not consistent with the results of projects or courses assessment;
- Lack of practical works in the curriculum.

Opportunities
- Unique programme that includes electronics as well as physics, with a strong theoretical and mathematical background that reflects the experience of the teaching staff. Such a programme can be interesting for innovative companies that work in the field of acoustic electronics.

Threats
- No observation.

3. Resources

3.1 Teaching staff

The teaching staff are recruited and evaluated according to the national Ukrainian legislation and institutional (KPI) requirements, as specified in the self-evaluation report (SER). The SER annexes provide the curricula vitae of the teaching staff; there are 4 persons in charge of general engineering components of the curriculum and 7 persons in charge of the speciality courses (both compulsory and optional). Several external teaching staff, among the industrial partners, also intervene in the programme, especially experts in the field of study.

The average age of the teaching staff is 63, as inferred from the submitted curricula vitae, which poses a long-time risk. It seems that there is no medium-term planning regarding the recruitment of teaching staff although recruitment to cover the vacancies appears yearly.

According to the declaration of KPI's management, there are 25 students enrolled in total in the two years of the master's programme; thus, the student to teaching staff ratio is about 3, which seems reasonable for a good achievement of the educational and professional outcomes of the programme.

According to a KPI's internal procedure, every 5 years, all teaching and research staff must follow professional development. Some of this development is provided by the "Institute of postgraduate education", an internal institute of KPI. Teaching staff also improve their skills by attending research conferences and workshops, or through an international mobility programme with the help of the department of academic mobility or the international collaboration department of the university, within the framework of Erasmus+.

The master's programme deals with both full-time and dual education students. It is not clear if the teaching staff has been prepared for this alternative methods of education. Also, it is not clear if the external teaching staff from the partner companies are vetted by the university or the institute.

Teaching staff can receive various incentives upon good performance in evaluations, research, and creative work. KPI has several such regulations and procedures, as noted in the SER.

3.2 Facilities and support staff

KPI is the largest engineering school in Ukraine. On its premises, KPI offers classrooms and laboratories that are suitable for the teaching process. The laboratories contain computers and equipment that is adequate for the proposed education programme. Some laboratories have been recently updated and equipped by industrial partners, for instance, the Lab for Electronic wireless security systems, provided by Ajax Systems. Other laboratories are in the process of construction (as explained in the SER): NDT-Lab, a laboratory of electronic means of acoustic control, and a laboratory for medical acoustics.
As shown in pre-recorded movies visualized during the evaluation and emphasized by the graduates, the hands-on, practical experience provided during the studies could be improved and more equipment could be updated to modern standards.

KPI currently runs online lectures and on-site practical activities (because of both the COVID-19 pandemic and the current war situation). The students use the corporate distance learning platform "Sikorsky", the automated information system "Electronic Campus" and the Google Classroom suite, as discussed during the evaluation meetings. KPI has a physical library and electronic documentation available through the institutional platforms; library staff are available.
Students are offered social and cultural facilities, as described in the SER : "clubs of the Igor Sikorsky Kyiv Polytechnic Institute Centre for Culture and Arts ; university recreation centres;

canteens and buffets of the student nutrition centre ; shared spaces such as Lampa Open Electronics Laboratory; free Student Coworking "Belka", Student Art Space "Tower", Art space "Public platform of KPI Colosseum"; the rock climbing club, etc.

There are also student governing bodies : a Student council, a Student campus council, a Professional Committee of KPI students.

3.3 Financial resources

As mentioned in the self-evaluation report, KPI receives centralized funds, according to a standard national calculation; detailed breakdown is available online. Additional support is available from industrial partners that, for instance, donated laboratory equipment : the educational and scientific laboratory of electronic means of acoustic control NDT-Lab "ULTRACON-SERVICE", and the educational and scientific laboratory "Medical Acoustics".

It seems that there is no medium-term financial planning regarding the acquisition of laboratory equipment.

The meetings held during the evaluation showed that the available funds seem reasonable for a correct functioning within the current conditions from Ukraine.

3.4 Student support services

As indicated in discussions during the evaluation, the students are provided with career advice, tutoring and assistance under various forms. Teaching staff are assigned as tutors of the master's programme. Individual advisors help with the dissertation, with preparing the dissertation scientific work, as well as with the internship preparation and monitoring.

As presented in the SER, students with special educational needs are also taken into consideration.

3.5 Partnerships

KPI has a significant number of partnerships with companies and socio-economic actors. These partnerships are refined at faculty-level, those for the Faculty of Electronics are listed here. For the master's programme under evaluation, the partners are "Ultacon-Service" LLC, "Ajax Systems Scientific and Production Enterprise" LLC, "Kyiv Scientific Research Institute of Hydro Devices", "MAG Audio" LLC, "AURORA" Hearing Rehabilitation Medical Center. The industrial partners are engaged in a variety of activities with KPI, offer internships, practical internships, laboratory equipment, targeted lectures by specialists and dual educational programmes.

An academic mobility under a double degree programme has been developed with the University of Le Mans, in France. Other international academic partnerships exist with Hungary, Austria, Slovenia, etc. They provide international mobility for the teaching staff, contributing to the programme outcomes.

The number of mobility that is achieved under these partnerships is limited, due in part to the COVID-19 epidemic and the current war situation in Ukraine.

Synthetic analysis - Resources

Strengths
- Experimented teaching staff;
- Good relations with the socio-economic environment.

Weaknesses
- Limited involvement of the representatives from the socio-economic environment in the planning of the educational process: no company in the programme supervisory board;
- Limited involvement of the representatives of the socio-economic environment in the evaluation of students' skills and competences: no participation in the jury for the dissertation defence, for instance.

Opportunities
- Increased migration towards e-learning and development of electronic books and documentations.

Threats
- Lack of medium-term planning for the recruitment of teaching staff;
- Uncertainty on the public financial allocation which is the main resource.

4. Student Admission, Transfer, Progression and Graduation

4.1 Rules governing the students' academic career
Admission rules are given on the KPI [website](#).
Applications are submitted electronically. Exceptions may apply, and they are listed. In order to enter the programme, a student must have a bachelor's degree, pass an entrance exam and write a motivation letter. The entrance exam includes a foreign language test, a general academic competence test and a professional test. The calendar for registration, tests and results is also available on the website but may be subject to changes because of the current martial law.

Regulations for the recognition and the validation of higher education qualifications, periods of study and prior learning are also available on the [website of KPI](#). Foreign degrees are considered. Regulations on current, calendar and semester control of study results are documented [online](#) aswell. They describe the way KPI manages the students' progression in their studies.

Regulations for the certification of students' studies are documented [here](#). An examination commission is created to assess students' qualified works. It includes a head, a secretary and members who are acquainted with the works submitted for defence. Typical qualified works are degree projects, thesis, or master's dissertations. Every stage of preparation is defined until the meeting for the presentation of the applicant's work and the decision of the examination commission. The different phases of the procedure are rather classic. Conflict management is also included.

4.2 Entrance students
Specific details regarding exam performance results in the first year have not been provided in the SER or connected documents.

4.3 Student assessment
The analysis of the latest assessment results indicates an excellent performance of students in the educational programme. An average of over 75% of students complete tasks on time and with high quality throughout the semester. Furthermore, according to the results of the summative assessment, 75% of students in the educational programme rank among the best in their field, achieving an average success score of 81.2 out of 100.

Unfortunately, no proof of these results is given in the SER.

4.4 Student progression
No evidence of student results is given in the SER concerning student progression. Nevertheless, students are close to several partner companies that provide technical equipment, teachers, and internships.

Involvement in scientific projects, as well as success in competitions such as the Sikorsky Challenge, suggests students' adequate preparation and positive outcomes within the educational programme.

The results of monitoring students' progress in different years of the programme indicate significant advancement within the educational framework. Specifically, students can choose certificate programmes that enhance their practical skills and contribute to their development in their chosen profession. Active participation in certificate programmes demonstrates their involvement in relevant activities and the development of necessary competencies.

Regarding the monitoring of dropouts, the data indicate a low dropout rate, signalling a strong commitment of students to the educational programme. The choice of valuable

certificates and programmes for their future profession may contribute to this low dropout resistance.

The results of the monitoring of the credits obtained by students between the course years highlight a consistent progression and efficient transition from one year to the next.

As for monitoring, the duration of studies leading to graduation, the information indicates efficient navigation through the study programmes, with students' positive outcomes reflected in active participation in research activities and notable achievements in the field.

These overall findings indicate significant success within the educational programme, illustrating both students' commitment and its effectiveness in preparing them for successful careers.

Synthetic analysis
Students Admission, Transfer, Progression and Graduation

Strengths
- Student engagement: monitoring results indicate a strong commitment of students to the programme, highlighted by active involvement in scientific projects and relevant competitions;
- Efficient progress: credit monitoring shows an efficient progression of students between years, reflecting their effective navigation through the study programmes;
- Participation in and implementation of various projects aimed at enhancing the quality of higher education.

Weaknesses
- Lack of student involvement in the programme review process;
- Unfamiliarity of students with the assessment appeal procedure.

Opportunities
- Internships and practical projects: integrating more extensive internship programmes and practical projects could improve students' preparation for the job market.

Threats
- Competition in education: competitive pressure in higher education could affect the programme ability to attract students and resources.

5. Internal Quality Assurance

5.1 Policy and processes for the quality assurance of programmes

Regulations on the internal quality assurance system in higher education at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" is detailed in a document written in Ukrainian and in English. The quality assurance policy of the university is compliant with national and European regulations.

The university defined 5 levels of organisation: students; implementation of educational programmes within departments; implementation and administration of educational programmes within faculties and institutes; vice-rectors in the field of activity; system-making decisions with the Supervisory board, the Academic council, and the Rector.

Kyiv Polytechnic Institute relies on the accreditation and licensing department of the university for the quality assurance management system.

5.2 Management system of the programme

Quality assurance policies and procedures relevant to the programme are detailed in a document available in Ukrainian and in English. Quality assurance processes involve students, teachers, staff, employers, commissions of the university for the electronics specialty. They refer to the programmes update as well as programmes and teachers' evaluation. The educational and scientific centre of applied sociology "Sotsioplus" conducts the surveys and discusses the results with the scientific and methodical commission of the electronics specialty.

No example of surveys was given in the self-evaluation report.

5.3 Programme review and development

Regulations on development, approval, monitoring and review educational programmes at Igor Sikorsky KPI is detailed in a document available in Ukrainian and English.

Programme reviews are based on annual surveys of students, teachers, staff, employers, or external stakeholders. They may imply update or modernization.

The last change concerns the international part of the programme. An agreement has been signed between Le Mans University and Kyiv Polytechnic Institute for a master's double-degree in the field of acoustoelectronics.

No evidence of a regular review of the programme is given in the self-evaluation report. The last review that is mentioned in the self-evaluation report is dated from 2021.

5.4 Student feedback on the learning process

Students answer a questionnaire at the end of each semester for the evaluation of their teachers. They also have informal discussions with teachers while they can express their opinion on the quality of course modules.

An example of a survey is given in the self-evaluation report for new graduates. It shows a rather good correspondence between skills that are acquired during the educational programme and the needed competences for the modern labour market. Several pieces of information are missing such as the number of students who answered the survey, the diploma that they received, the date of the diploma and the date of the survey.

The programme evaluation is discussed at the level of the student council of the faculty. Very few students of the panel are involved in the student council because it requires too much time.

5.5 Engineering graduates' placement

Several cooperation agreements have been signed with companies in the field of acoustics and electronics. These companies are the main employers of the graduates in this programme. The graduates' job placement is examined by the educational and scientific centre of applied sociology "Sotsioplus". Employers and former students that the expert team interviewed were mostly satisfied with the graduates' profiles.

5.6 Public availability of information

Official documents from the Ukrainian government, from the university, or from Europe are available on the university website.

Only part of the university website is translated into English, for foreign students.

Synthetic analysis - Internal quality assurance

Strengths
- A strong and detailed internal quality assurance system at university level.

Weaknesses
- Little evidence of surveys;
- Poor analysis of graduate's placement.

Opportunities
- Cooperation agreement with Le Mans University.

Threats
- Lack of support from Europe for Higher Education Quality Assurance.

Master's degree in Electronic Systems of Multimedia and Internet of Things Technology (ESMIoTT)

1. Programme aims

1.1 Educational needs of the labour market and other stakeholders

KPI identified different stakeholders and some employer representatives who are involved in reviewing and updating the content of educational programs and specific educational components. Several employers sent letters of support to the programme, offering recommendations on the content of professional competencies and learning outcomes that align with their needs, as well as on individual educational components. These recommendations were taken into account for the definition of the programme aims and outcomes.

Goldberry LLC, owner of TV channel Espresso, recommends including an item about modern computer and information technologies for audiovisual systems.Home systems, which develops smart house solutions, recommends including practical tasks related to the maintenance of systems, and the ability to analyse and synthesize control and management systems, especially those including Internet of Things tools. However, the number of the proposed internships is either low or not given. Ajax systems, which develops and manufactures wireless and wired security systems, suggests to provide disciplines that have a direct connection with the design of Internet of Things devices, with the programming of microprocessor devices, and with modern wireless technologies.

The content of the educational program was also discussed with representatives of other higher education institutions, in particular with the Dean of the Faculty of cinema and television of the Kyiv National University of Culture and Arts as well as the applicants.

Moreover, two agreements were concluded for a dual form of education with the State Academic Orchestra "Olexandr Fokin RadioBand", and with Ajax Systems Manufacturing.

1.2 Programme Aims

The programme is in line with the development strategy of the university that is described in a document written in Ukrainian only. The educational programme aims at training electronics specialists capable of solving complex specialized problems and practical problems of design, production, operation, maintenance, repair, and modernization of electronic multimedia systems and Internet of Things tools.

One distinctive feature of this educational program is the combination of engineering and technical expertise in the fields of electronic and information systems, applied to television, cinematography, and audiovisual systems.
Another characteristic of the programme is the option of studying in a dual form, that is a combination of theoretical and practical training.

Targeted graduate employment is mainly in electronics and telecommunications. Graduates may continue their studies at a doctorate level.

Programme competencies include 8 common competencies and 12 professional competencies. These competencies have been commented by at least 3 companies: Ajax Systems, Home Systems, and Goldberry LLL-TV Channel Espresso.

The educational programme consists of two main parts: normative educational components (67 ECTS) and elective components (23 ECTS). The normative educational components are

divided into a general training cycle and a vocational cycle. The duration of the educational programme is 16 months.

1.3 Programme outcomes

The educational programme established 16 learning outcomes. Each programme outcome defines a professional skill. A matrix provides connections between programme learning outcomes and relevant components of the educational programme, that are normative courses of the general and the vocational training cycles.

The theoretical content of the subject area contains the fundamental construction principles of modern electronic multimedia systems and Internet of Things technology, control and management systems, modelling methods of the objects and processes and their optimization, modern computer and information technologies for audiovisual information processing, tools of engineering and scientific research, theory of planning and carrying out the experiments.

The originality of the educational programme is its focus on electronic multimedia devices and tools. Within this scope, the programme addresses theory, methods, technologies, tools, and devices.

Synthetic analysis - Programme aims

Strengths
- Strong and diverse partnerships with companies.

Weaknesses
- Integrating both multimedia and Internet of Things into the program.

Opportunities
- Diverse application fields such as home systems, healthcare, entertainment.

Threats
- Decrease of the number of applicants.

2. Teaching and Learning Process

2.1 Teaching and Learning Process

The Master's programme in Electronic systems of multimedia and Internet of Things technology has two core program documents : the so-called "Educational professional program" including the description of the programme with the learning outcomes, the list of components, the description of final certifications, matrix of correspondence between competences and components of the programme, matrix of correspondence between learning outcomes and components of the programme; and the curriculum including the schedule of educational process, the list of components, the number of credits, the number of contact hours. Both documents are formally approved by the HEI following internal regulations: developed by the project team headed by the project team leader, agreed by the scientific and methodological commission of specialty in KPI, and further by the methodological council of KPI, and finally approved by the academic council of the university and entered into force by the order of Rector. The dates of formal approvals are prior to the starting of the programme.

The programme follows the standard of higher education for master level for specialty 171 "Electronics": the volume of the programme in ECTS credits, the list of programme competencies and learning outcomes consists of all programme competencies and learning outcomes from the standard, ECTS credits for practice (in the programme it is at 14 and standard requirements are at least 10), the form of the final certification of students that is the defence of the final qualification work or master thesis, etc.

The programme is composed of the following parts:
1. General training cycle (11 ECTS), consisting of the following courses: "Intellectual property and patenting", "Fundamentals of engineering and technologies of sustainable development", "Practical course on foreign language professional communication", "Startup projects marketing". These courses are unified at university level, and the content is common for all master programs in the faculty of electronics.
2. Vocational training cycle (22,5 ECTS), consisting of the following courses:
- *"Means and technologies of three-dimensional animation"* – software for 3D animation (Blender)
- "*Network technologies of audiovisual content transmission"* – software for video-coding, video-streaming (Wirecast), software for creation of multimedia centres, cloud storages.
- *"Internet streaming systems"* – compression of multimedia data, protocols of streaming, content delivery networks.
- *"Means of monitoring of technical parameters of multimedia systems"* – simulation of electronic circuits in Multisim software, measurement of audio parameters in software Adobe Audition.
- *"Information protection in data transmission networks"* – methods of data protection such as encryption, authentication and authorisation, protection of computer networks – shields and VPN.
3. Research (scientific) component (33,5 ECTS) consisting of the following courses: "Scientific work on the topic of the master's thesis", "Practice" and "Master thesis". Topic and content of some master theses were analysed by the expert team. It was found that they mainly focused on the selection of equipment for TV studio (selection of cameras, mixer devices, microphones, lightning, etc.), economical evaluation of selected equipment, and planning of the studio.
4. Elective courses (23 ECTS):
It should be noted that the second part of the programme title, "Internet of Things technology", is not presented in the core courses of the programme. Courses related to this technology are only offered among the elective components that might not be selected by the students. In such a case, the title of the programme does not fully match the programme content. Furthermore, electronics is presented only partially in the core courses, for example,

as a simulation of some electrical circuits in Multisim. Most vocational training courses are focused on Information and Communication Technology (ICT): networks, software for the processing of audiovisual data, production of audiovisual content etc. This situation can lead to problems with the accreditation of the programme on the national level and recognition of the diploma in the employment of graduates outside the field of audiovisual production and multimedia technologies but connected with the design/production/use of electronic equipment.

The programme curriculum embeds a student-centred learning and teaching approach and enables flexible learning paths through a set of elective courses. It encourages students to take an active role in co-creating the learning process and forms an individual educational trajectory.

2.2 Assessment of students' learning

The university uses a 100-point scaling grade for the assessment of students' learning, that further can be transformed into ECTS grade (A, B, C, D, E, FX, and F), and to national scale (excellent, good, satisfactory, or failed). All courses in the syllabus have clear explanations about assessments of learning outcomes, the number of points for each part of the course, for example: assessment of laboratory work, practical tasks, homework, etc.

Regulations on the evaluation of learning outcomes is very well documented. The document describes several types of control: current control (a type of ongoing control); calendar control for each discipline at fixed dates; semester control, detailed in the syllabus of each discipline, assessing exams or credits.

The programme consists of components and courses, each of which has a final control in the form of an exam, a final test, or the defence of the master's thesis. Considering that the educational process has been provided in an online format since the COVID-19 outbreak (2020) and the war in Ukraine (2022), all assessments also have an online format. The students explained, during the meetings with the evaluation team, that there are formal procedures during exams – the web-camera should be always on during the assessments, the ID card with the photo of the student should be shown at the beginning of the assessment, and the answers should be handwritten on paper and discussed later with the professor that holds the course.

Each component of the educational programme lists the types of control and the rating system of evaluation that are used for its assessment.

2.3 Planning of the learning process

The programme has a clear calendar of the educational process that is included in the curriculum. The programme consists of 3 semesters, with a total duration of 1 year and 4 months. The first and the second semesters have both 18 weeks of lectures, practice, and lab exercises, and 2 weeks of examinations. The third semester consists of 8 weeks of practice, 9 weeks of research, and 1 week for the assessment of the master's theses. The number of weeks in each semester is sufficient for achieving the learning outcomes as described in the programme description.

The timetable is accessible online via a special website that is convenient for students and academic staff.

2.4 Management of the learning process

KPI provided the examination result lists for the course project and the final master thesis defence. The statistical analysis is the following: 6 "excellent", 1 "very good", 1 "good", 1

"satisfactory" and 1 "failed" for the master thesis defence, for group DV-11mp[1]; 2 "excellent", 5 "very good" and 1 "failed" for group DV-12mp[2].
Assessment of the course project has a similar distribution: 8 "excellent", 1 "very good" 2 "good", 1 "satisfactory" 1 "failed" for group DV-11mp; 4 "excellent", 1 "very good" 1 "good", 4 "enough" 2 "failed" for group DV-12mp.

These results show that most students assessed as "excellent" or "satisfactory/enough" but the number of scores "very good/good" is much lower. This means that the management of the learning process should check the adequacy of the assessments or possibly change the complexity of the tasks.

Teaching and learning process are supposed to be regularly evaluated, including feedback loops from students and academic staff. These evaluations are conducted by the Educational and scientific centre of applied sociology "Sotsioplus", using polls. Students regularly answer a survey for the evaluation of the quality of their training. The results reveal the level of achievement of learning outcomes for students. Feedback from academic staff and students are submitted by online questionnaires connected to the "Electronic campus" system at the end of each semester. Yet, there is a lack of information on how these polls and questionnaires are used: the number of answers is not specified; is there a feedback to academic staff and students? ; How are the results of the surveys used for changing the programme content, courses, modules, complexity of individual tasks, procedures of assessment?; etc.

The composition of thesis juries does not include any representative of business or research institutions. It is too bad because these representatives might give interesting feedback on the programme.

Synthetic analysis - Teaching and Learning Process

Strengths
- Good organisation of the educational process and a wide variety of online tools.

Weaknesses
- Internet of Things technology is not presented in the content of core courses of the programme, so the title of the programme does not fully correspond to its content;
- Part of the programme focuses on the scientific research, but the master's thesis has a clear practical orientation without any scientific research part;
- Lack of practical works in the curriculum.

Opportunities
- Unique educational content that doesn't have any similarities in other Ukrainian HEIs that is attractive for students who are interested in the development of production, processing, or transmission of audio-visual content, or for people who already work in such an industry and who want to improve their skills.

Threats
- The content of the core courses does not fully correspond to the Electronics specialty as it is described in the standard of the higher education for master level (specialty "Electronics").

---

[1] Group DV-11mp refers to the first group of the first promotion of students in the ESMIoTT program who started in 2021.
[2] Group DV-12mp refers to the second group of the first promotion of students in the ESMIoTT program who started in 2021.

3. Resources

3.1 Teaching staff

The teaching staff are recruited and evaluated according to the national Ukrainian legislation "On Higher Education" and institutional (KPI) requirements. The SER annexes provide the curricula vitae of the teaching staff; there are 4 persons in charge of general engineering components of the curriculum and 8 persons in charge of the speciality courses of the curricula (both compulsory and optional). Several external teaching staff, among the industrial partners, also intervene in the programme, especially as experts in the field of study.

The average age of the teaching staff is of 62 years, as inferred from the submitted curricula vitae, which poses a long-term risk. It seems that there is no medium-term planning regarding the recruitment of teaching staff; recruitment appears yearly in order to cover the vacancies.

According to the declaration of KPI's management, there are 25 students enrolled in total in the two years of the master's programme; thus, the student to teaching staff ratio is about 3, which seems reasonable for a good achievement of the educational and professional outcomes of the programme.

According to a KPI internal procedure, every 5 years all teaching and research staff must improve their professional qualifications. Professional development is provided by the "Institute of postgraduate education", an internal institute of KPI. Teaching staff also improve their skills by attending research conferences and workshops, or through an international mobility programme with the help of the department of academic mobility or the international collaboration department of the university, within the framework of Erasmus+.

The master's programme deals with both full-time and dual education students. It is not clear if the teaching staff has been prepared for this alternative type of education. It is not clear either whether the external teaching staff, from the partner companies, are vetted by the university.

Teaching staff can receive various incentives upon good performance in evaluations, research, and creative work. KPI has several such regulations and procedures, as noted in the self-evaluation report.

Due to the Covid-19 pandemic and the war, the university and KPI had to adapt their organisation. The evaluation team was impressed by the good results.

3.2 Facilities and support staff

KPI is the largest engineering school in Ukraine. On its premises, KPI offers classrooms and laboratories that are suitable for the teaching process. The laboratories contain computers and equipment that is adequate for the proposed education programme. Some laboratories have been recently updated and equipped by industrial partners, for instance the Lab for Electronic wireless security systems, provided by Ajax Systems. Other laboratories are in the process of refurbishing. As shown in pre-recorded videos visualized during the evaluation and emphasized by graduates, the hands-on, practical experience provided during the studies can be improved and more equipment can be updated to modern standards.

KPI currently runs online lectures and on-site practical activities (because of both the Covid-19 pandemic and current war situation). Students have a complete access to the educational programme through the "Sikorsky" distance learning platform, the automated information system "Electronic Campus" and the Google Classroom suite, as discussed during the

evaluation meetings. KPI has a physical library and electronic documentation is also available through the institutional platforms; library staff are available.

Students are offered social and cultural facilities : a Centre for Culture and Arts with artistic amateur groups; sport complex, recreation centres and student nutrition centre. They have access to shared spaces: the "Lampa" Open Electronics Laboratory ; free Student Coworking "Belka"; Student Art Space "Tower" ; Art space KPI public platform "Colosseum"; a rock climbing club, etc.

There are also student governing bodies : a Student council, a Student campus council, a Professional Committee of KPI students.

3.3 Financial resources

As mentioned in the SER p. 15, KPI receives centralized funds, according to a standard national calculation; detailed breakdown is available online.

Additional support is available from industrial partners that, for instance, donate laboratory equipment (SER p. 14), such as the Ajax Systems company which created the Educational and scientific laboratory of wireless security systems.

It seems that there is no medium-term financial planning regarding the acquisition of laboratory equipment.

The meetings held during the evaluation showed that the available funds seem reasonable for a correct functioning within the current conditions in Ukraine.

3.4 Student support services

As indicated in the discussions held during the evaluation, the students are provided with career advice, tutoring and assistance under various forms. Teaching staff are assigned as tutors of the master's programme. Individual advisors help with the dissertation, with preparing the dissertation scientific work, as well as with the internship preparation and monitoring.

KPI has a Department of Social and Psychological Work, which offers social support for higher education applicants, with an online access through the website of the Student Social Service of the university.

As presented in the school's report, students with special educational needs are also taken into consideration.

3.5 Partnerships

KPI has a significant number of partnerships with companies and socio-economic actors. These partnerships are refined at faculty-level, those for the Faculty of Electronics are listed at here. For the master's programme under evaluation, the partners are: Goldberry LLC, owner of TV channel Espresso; Home systems LLC; Ajax Systems Manufacturing.

The industrial partners are engaged in a variety of activities with KPI: internships, practical works, laboratory equipment, targeted lectures by specialists and dual educational programmes.

KPI also signed partnership contracts with foreign HEI. Thus, students and academic staff may go on an international academic mobility. Examples of two students are given in the self-evaluation report, for example in Norway and in Spain. These international partnerships contribute to the programme outcomes. The number of mobility achieved under these partnerships is limited, due in part to the COVID-19 epidemic and to the current war situation in Ukraine.

Synthetic analysis - Resources

Strengths
- Experimented teaching staff;
- Good relations with the socio-economic environment.

Weaknesses
- Limited involvement of the representatives from the socio-economic environment in the planning of the educational process: no company in the program supervisory board;
- Limited involvement of the representatives of the socio-economic environment in the evaluation of students' skills and competences: no participation in the jury for the dissertation defence, for instance.

Opportunities
- Increased migration towards e-learning and development of electronic books and documentation.

Threats
- Lack of medium-term planning for the recruitment of teaching staff;
- Uncertainty on the public financial allocation which is the main resource.

4. Student Admission, Transfer, Progression and Graduation

4.1 Rules governing the students' academic career

Admission rules are given on the [website](#) of KPI.

Applications are submitted electronically. Exceptions may apply, and they are listed. In order to enter the programme, a student must have a bachelor's degree, pass an entrance exam and write a motivation letter. The entrance exam includes a foreign language test, a general academic competence test and a professional test. The calendar for registration, tests and results is also available on the website but may be subject to changes because of the current martial law.

A large set of regulations rule the organisation of the educational programme:

- [Organisation of the educational process](#) defines the levels and degrees of higher education and study programme, the educational process planning, forms and types of classes, the learning assessment and recognition, transfer of students, the methodological support, the quality of Higher education;
- [Academic mobility](#) for outgoing and incoming applicants as well as staff, defining the organisational and financial support, and the recognition of the results for applicants and staff;
- [Recognition of results from previous education](#) ;
- [Recognition of learning outcomes acquired](#) ;
- [Description of learning results control](#) ;
- [Examination commission](#) and attestation of higher education applicants for determining the procedure for establishing and organising the work of the examination commission.

The features of the educational programme are considered in competitive situations to form a ranking of candidates based on the written evaluation of results and motivation letters. Due to martial law, the foreign language exam was cancelled. Questions for the professional exam are periodically updated.

4.2 Entrance students

No result of the examination performance in the first year has been provided in the SER or connected documents.

4.3 Student assessment

According to the analysis of students' learning assessment results, it is observed that, on average, over 63% of students in the educational program complete their tasks on time and with quality in each semester. These data offer specific insights into students' performance at the level of modules and study subjects.

Moreover, the monitoring results for the achievement of learning objectives indicate that 30% of students in the program are included in the category of the best students in their field, with an average success score of 77.53 in the semester control. These figures signify that learning objectives are substantially met, confirming the effectiveness of the teaching and learning process at the level of course units/modules.

In conclusion, assessment and monitoring results tend to prove the quality of the learning process. Unfortunately, no proof of these results is given in the SER. The evaluation team expected result of the assessment of the students' learning in each module and each semester.

4.4   Student progression

The results of monitoring dropouts show that the program manages to maintain a low level of study abandonment, suggesting a high level of student engagement and interest in the program.

Monitoring the credits obtained by students who pass from one year to the next demonstrates continuous progress, indicating that students successfully meet academic requirements and consistently advance within the educational program.

The results of the monitoring of the duration of studies leading to graduation highlight that students manage to complete the program within a reasonable timeframe, reflecting efficient planning and management of their academic trajectory.

Synthetic analysis
Students Admission, Transfer, Progression and Graduation

Strengths
- Student engagement: monitoring results indicate a strong commitment of students to the programme, highlighted by active involvement in scientific projects and relevant competitions;
- Efficient progress: credit monitoring shows an efficient progression of students between years, reflecting their effective navigation through the study programs;
- Participation in and implementation of various projects aimed at enhancing the quality of higher education.

Weaknesses
- Lack of student involvement in the programme review process;
- Unfamiliarity of students with the assessment appeal procedure.

Opportunities
- Internships and Practical projects: integrating more extensive internship programmes and practical projects could improve students' preparation for the job market.

Threats
- Competition in education: Competitive pressure in higher education could affect the programme ability to attract students and resources.

5. Internal Quality Assurance

5.1 Policy and processes for the quality assurance of programmes

Regulations on the internal quality assurance system in higher education at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" is detailed in a document available in Ukrainian and in English. The quality assurance policy of the university is compliant with national and European regulations.

The university defined 5 levels of organisation: students; implementation of educational programs within departments; implementation and administration of educational programs within Faculties and Institutes; vice-rectors in the field of activity; system-making decisions with the Supervisory Board, the Academic Council, and the Rector.

Kyiv Polytechnic Institute relies on the accreditation and licensing department of the University for the quality assurance management system.

5.2 Management system of the programme

Quality assurance policies and procedures relevant to the programme are detailed in a document available in Ukrainian and in English. Quality assurance processes involve students, teachers, staff, employers, commissions of the university for the Electronics specialty. They concern the programmes update as well as programmes and teachers evaluation. The educational and scientific centre of applied sociology "Sotsioplus" conducts the surveys and discusses the results with the scientific and methodical commission of the Electronics specialty.

No example of surveys was given in the self-evaluation report.

5.3 Programme review and development

Regulations on development, approval, monitoring and review educational programmes at Igor Sikorsky KPI is detailed in a document available in Ukrainian and English.

Programme reviews are based on annual surveys of students, teachers, staff, employers, or external stakeholders. They may imply update or modernization. Major changes of the programme were made in 2020. Another revision took place in 2021. No evidence of a regular review of the programme is given in the self-evaluation report.

5.4 Student feedback on the learning process

Students answer a questionnaire at the end of each semester for the evaluation of their teachers. They also have informal discussions with teachers and can express their opinion on the quality of course modules.

The programme evaluation is discussed at the level of the student council of the faculty. Very few students of the panel are involved in the student council because it requires too much time.

5.5 Engineering graduates' placement

The graduates' job placement is examined by the educational and scientific centre of applied sociology "Sotsioplus". Employers and former students that the expert team interviewed were mostly satisfied with the graduates' profiles. No numerical result was presented.

5.6 Public availability of information

Official documents from the Ukrainian government, from the university, or from Europe are available on the university website. Only part of the university website is translated into English, for foreign students.

Synthetic analysis - Internal quality assurance

Strengths
- A strong and detailed quality assurance system at university level.

Weaknesses
- Little evidence of surveys;
- Poor analysis of graduate's placement.

Opportunities
- International partnership.

Threats
- Lack of support from Europe for Higher Education Quality Assurance.

Global summary of the evaluation

The university put in place many regulations for the educational process, for the internal quality assurance, for the development, approval, monitoring, and review of educational programmes, for the assessment systems. These regulations permeate all levels within the university. Yet not all commissions and committees include representatives of the partner companies and of the students.

The electronics faculty signed strong partnerships with companies, allowing the students to work on modern equipment and to have a direct contact with professionals in their field of study, for advice and internships. This complements the experimented staff of the institute. Students are involved in several project works even outside the university. They are encouraged to come up with their own project topic which is a way to develop their autonomy.

Global synthetic analysis

Strengths
- Strong and diverse partnership with companies;
- Solid theorical approach of the educational process;
- Good organisation of the educational process and a wide variety of online tools;
- Experimented teaching staff;
- Student engagement: monitoring results indicate a strong commitment of students to the programme, highlighted by active involvement in scientific projects and relevant competitions;
- Efficient progress: credit monitoring shows an efficient progression of students between years, reflecting their effective navigation through the study programmes;
- Participation in and implementation of various projects aimed at enhancing the quality of higher education;
- A strong and detailed internal quality assurance system at university level.

Weaknesses
- Companies did not specify the number of internships they are ready to offer for the programme;
- The results of theses assessment are not consistent with the results of projects or courses assessment;
- Lack of practical works in the curriculum;
- Limited involvement of the representatives from the socio-economic environment in the planning of the educational process: no company in the programme supervisory board;
- Limited involvement of the representatives of the socio-economic environment in the evaluation of students' skills and competences: no participation in the jury for the dissertation defence, for instance;
- Lack of student involvement in the programme review process;
- Unfamiliarity of students with the assessment appeal procedure;
- Little evidence of surveys;
- Poor analysis of graduates' placement.

Opportunities
- Cooperation agreement with Le Mans University;
- Unique programme that includes electronics as well as physics, with a strong theoretical and mathematical background that reflects the experience of the teaching staff. Such a programme can be interesting for innovative companies that work in the field of acoustic electronics;
- Increased migration towards e-learning and development of electronic books and documentations;
- Internships and practical projects: integrating more extensive internship programmes and practical projects could improve students' preparation for the job market.

Threats
- Drop of the number of applicants;
- Lack of medium-term planning for the recruitment of teaching staff;
- Uncertainty on the public financial allocation which is the main resource;
- Competition in education: competitive pressure in higher education could affect the programme ability to attract students and resources;
- Lack of support from Europe for Higher Education Quality Assurance.