

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE  
NATIONAL TECHNICAL UNIVERSITY OF UKRAINE  
"IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE"**

APPROVED

by Academic Council of  
Igor Sikorsky Kyiv Polytechnic Institute

(protocol № \_\_\_\_ dated «\_\_\_\_» \_\_\_\_\_ 20\_\_\_\_ p.)

Head of the Academic Council

\_\_\_\_\_ Mykhailo ILCHENKO

**ENVIRONMENTAL SAFETY**

**EDUCATIONAL AND SCIENTIFIC PROGRAM**

**second (Master's) level of higher education**

**Program Subject Area 101 Environmental Studies**

**Field of Study 10 Natural Sciences**

**Qualification Master of Environmental Studies**

Came into force in 2022/2023 study year  
by the Order of Rector  
of Igor Sikorsky Kyiv Polytechnic Institute  
dated \_\_\_\_\_ 20\_\_\_\_ № \_\_\_\_\_

Kyiv – 2021

## PREAMBLE

**DEVELOPED** by the project team:

Project team leader:

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Project team members:

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Pshinko Halyna Mykolaivna, Doctor of Chemical Sciences, senior researcher, Head of the analytical and radiochemistry department of the A. V. Dumansky Institute of Colloid and Water Chemistry of the National Academy of Sciences

Ivanova Veronika Petrivna, PhD, sales manager at IVIK Formula Water, graduate

### AGREED:

Scientific and Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute for program subject area 101 Environmental Studies

Head of the Scientific and Methodological Council of the University

\_\_\_\_\_ Mykola GOMELYA

(protocol № 5 dated « 18 » 11 2021)

Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute

Head of the Methodological Council

\_\_\_\_\_ Yuriy YAKYMENKO

(protocol №     dated «     »     20     .)

### CONSIDERED:

According to the results of the review and public discussion of the EP, after receiving all the suggestions and proposals of stakeholders (<https://eco-paper.kpi.ua/navchannia/osvitni-prohramy.html>), the educational and professional program was discussed at the meeting of the Department of Ecology and Plant Polymers Technology (protocol № 5 dated 17.11.2021). The results of the discussion in the form of an extract from the department meeting were forwarded to SMCU 101 Environmental Studies.

In accordance with the recommendations of the Department of Educational Process Organization, the distribution of educational program components by training credits in the program was changed. In addition, the unification of optional disciplines was carried out and the system of students' choice of these disciplines was updated. The list of educational components was detailed.

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# 1. PROFILE OF THE EDUCATIONAL PROGRAM

<b>1 – Загальна інформація</b>	
Повна назва ЗВО та інституту/факультету	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Faculty of Chemical Engineering
Ступінь вищої освіти та назва кваліфікації мовою оригіналу	HE Degree – Master Educational qualification – Master of Environmental Studies
Офіційна назва ОП	Environmental safety
Тип диплому та обсяг освітньої програми	Master's diploma, single, 120 ECTS credits, training period 1 year and 9 months
Наявність акредитації	Certificate of accreditation of the Program Subject Area by the Ministry of Education and Science of Ukraine НД № 1192612 in accordance with the decision of the Accreditation Commission dated 30.05.2013, protocol №104 Order of the Ministry of Education of Ukraine dated 04.06.2013 №2070-л, valid until July 1, 2023
Цикл/рівень ВО	NFQ of Ukraine - level 7 QF-EHEA - the second cycle EQF-LLL - level 7
Передумови	Bachelor's Degree
Мова(и) викладання	Ukrainian
Термін дії ОП	Until the next accreditation
Інтернет-адреса постійного розміщення освітньої програми	<a href="https://eco-paper.kpi.ua/">https://eco-paper.kpi.ua/</a> , section "Educational programs" <a href="https://osvita.kpi.ua/">https://osvita.kpi.ua/</a> section "Educational programs"
<b>2 – The goal of the educational program</b>	
<p>Training of specialists in the field of ecology, capable of solving complicated, including innovative, specialized complex tasks of the development of new and improving existing systems of environmental conservation and environmental protection from negative anthropogenic impact, carrying out organizational activities, conducting research, the results of which have scientific novelty, theoretical and practical significance; and, through a harmonious combination of fundamental knowledge and engineering tools with training in the humanitarian field, to successfully compete on the labor market in conditions of sustainable innovative scientific and technical development of society.</p> <p>Corresponds to the development strategy of Igor Sikorsky Kyiv Polytechnic Institute for 2020-2025 (<a href="https://data.kpi.ua/sites/default/files/files/2020-2025-strategy.pdf">https://data.kpi.ua/sites/default/files/files/2020-2025-strategy.pdf</a>).</p>	

<b>3 – Characteristics of the educational program</b>	
Subject area	<p><b>Description of the subject area:</b> structure and functional components of ecosystems of different levels and origins; anthropogenic impact on the environment and optimization of nature management.</p> <p><b>Learning objectives:</b> formation of a complex of knowledge, skills and abilities at applicants of higher education for the use in professional activities in the field of ecology, environmental protection and balanced nature management.</p> <p><b>Theoretical content of the subject area:</b> The concepts, principles of natural sciences, modern ecology and their use for environmental protection, balanced nature management and sustainable development.</p> <p><b>Methods, techniques and technologies:</b> The applicant must master the methods of collecting, processing and interpreting the results of environmental studies.</p> <p><b>Tools and equipment:</b> equipment and software necessary for field, laboratory and remote studies of the structure and properties of environmental systems of various levels and origins.</p>
Orientation of the EP	Educational and Scientific. The emphasis on the development of new and improvement of existing systems for conservation and protection of the environment from negative anthropogenic impacts
The main focus of the EP	<p>Special education in the field of natural sciences in Program Subject Area 101 Environmental Studies.</p> <p>Key words: ecology, biosphere, ecological systems, biocenosis, geotechnical systems, environment, sustainable development, natural resources, anthropogenic load, resource conservation, environmental protection, cleaner technologies.</p> <p>The program is based on well-known scientific provisions in the field of protection and conservation of the environment, taking into account the modern level of technology, and focuses on current scientific problems, within which further professional and scientific growth of applicants in the field of environmental monitoring, management of environmental protection activities, rational use of natural resources, management of resources in the conditions of technogenesis, the development of promising technologies for the reduction of anthropogenic load on the environment is possible.</p>
Features of the EP	<p>Interdisciplinary and multidisciplinary training of professionals in environmental studies. The program includes blocks of compulsory (general and vocational training cycles) educational components with the inclusion of a research (scientific) component that ensure the formation of general and professional competencies of the program subject area, as well as a block of optional educational components (vocational training cycles) that strengthen the competencies of the program subject area and are important for the further professional and scientific career of the applicants.</p> <p>The program provides for pre-diploma practice, including at companies and specialized scientific institutions; participation of applicants for higher education in student scientific circles; the possibility of teaching individual special courses in a foreign language, international activities in the field of mobility and internships for students and teachers.</p>

<b>4 – Qualification of graduates for employment and further studying</b>	
Qualification for employment	<p>Graduates can carry out professional activities according to the type of economic activity "Research and experimental development in natural sciences and engineering" (NACE code 73.10, ISIC code 731). Graduates can provide services related to scientific research and experimental development in the field of natural sciences, as well as consulting services related to environmental protection (DK code 016:2010 72.19.19, 72.19.50, 74.90.13). Graduates can work in primary positions in the professions defined by the National Classification of Ukraine: Classifier of professions DK 003: 2010.</p> <p>2211.2 Environmental Specialist  2211.2 Environmental Expert  2213.2 Engineer of Reproduction of Natural Ecosystems  2213.2 Engineer of the Protection of Natural Ecosystems  2213.2 Nature Management Engineer  2149.1 Research Staff (other fields of engineering)  2149.1 Junior Researcher (engineering field)  2149.2 Environmental Protection Engineer  2149.2 Technogenic and Environmental Safety Engineer</p>
Further training	<p>Study at the Doctor of Philosophy program at the third educational and scientific level of higher education.  Acquisition of additional qualifications in the postgraduate education system.</p>
<b>5 – Teaching and evaluation</b>	
Teaching and learning	<p>Student-centered learning through lectures, seminars, practical classes; personal differentiated and problem-oriented learning through laboratory and pre-diploma practice, self-study through consultations with a teacher, individual classes.</p> <p>All participants of the educational process are provided with timely, accessible and understandable information about the goals, content and program learning outcomes, the order and criteria of evaluation within individual educational components. Full preparation for research activities is provided through participation in scientific and innovative projects with the publication of results in professional journals. Opportunities for approbation of research results are provided, in particular, due to the annual International Scientific and Practical Conferences "Ecology. Human. Society" and "Clean water. Fundamental, applied and industrial aspects".</p>
Evaluation	<p>Current and semester control is carried out in accordance with the Rating system in the form of reports, presentations, tests and exams. Master's thesis defense.</p>
<b>6 – Program competencies</b>	
Integral competence	<p>The ability to solve complex tasks and problems in the field of ecology, environmental protection and balanced nature management and on the border of subject areas, and in the learning process, which involves conducting research and/or implementing innovations and is characterized by the complexity and uncertainty of conditions and requirements.</p>
<b>General competences</b>	
C 01	The ability to learn and master modern knowledge
C 02	The ability to make informed decisions
C 03	The ability to generate new ideas (creativity)
C 04	The ability to develop and manage projects

C 05	The ability to communicate in a foreign language
C 06	The ability to search, process and analyze information from various sources
C 07	The ability to motivate people and move towards a common goal
C 08	The ability to conduct research at an appropriate level
<b>Special (professional) competencies</b>	
C 09	Awareness at the level of the latest achievements, necessary for research and/or innovative activities in the field of ecology, environmental protection and balanced nature management
C 10	The ability to apply interdisciplinary approaches to critical understanding of environmental problems
C 11	The ability to use the principles, methods and organizational procedures of research and/or innovation activities
C 12	The ability to apply new approaches to the analysis and forecasting of complex phenomena, critical understanding of problems in professional activity
C 13	The ability to demonstrate knowledge and own conclusions to professionals and non-professionals
C 14	The ability to manage the strategic development of the team in the process of carrying out professional activities in the field of ecology, environmental protection and balanced nature management
C 15	The ability to organize works related to the assessment of the environmental state, environmental protection and optimization of nature management, in conditions of incomplete information and conflicting requirements
C 16	The ability to self-education and professional development based on innovative approaches in the field of ecology, environmental protection and balanced nature management
C 17	The ability to independently develop environmental projects by creatively applying existing and generating new ideas
C 18	The ability to assess the level of negative impact of natural and anthropogenic factors of environmental hazards on the environment and humans
C 19	The ability to develop a complex of management solutions
C 20	The ability to develop and improve methods and technologies
C 21	The ability to conduct professional, including scientific research activities in an international environment
C 22	The ability to coordinate trends in the resource consumption with the application of computer information technologies
C 23	The ability to collect and process information in order to obtain parameters characterizing the state of the environment
<b>7 – Program learning outcomes</b>	
PO 01	To know and understand the fundamental and applied aspects of environmental sciences
PO 02	To be able to use conceptual environmental patterns in professional activities
PO 03	To know the basic concepts of natural science, sustainable development and methodology of scientific knowledge at the level of the latest achievements
PO 04	To know the legal and ethical standards for the assessment of professional activity, development and implementation of socially significant environmental projects in the conditions of conflicting requirements
PO 05	To demonstrate the ability to organize collective activities and implement complex environmental projects, taking into account available resources and time constraints
PO 06	To know the latest methods and tools of environmental research, including methods and tools of mathematical and geoinformation modeling
PO 07	To be able to communicate in a foreign language in scientific, industrial and social spheres of activity

PO 08	To be able to communicate professional knowledge, own justifications and conclusions to specialists and the general public clearly and unambiguously
PO 09	To know the principles of personnel and resource management, the basis of approaches to decision-making in conditions of incomplete, insufficient information and conflicting requirements
PO 10	To demonstrate awareness of the latest principles and methods of environmental protection
PO 11	To be able to use up-to-date information resources on ecology, nature management and environmental protection
PO 12	To be able to assess landscape and biological diversity and analyze the effects of anthropogenic impact on the environment
PO 13	To be able to assess the potential impact of man-made objects and economic activities on the environment
PO 14	To apply new approaches to develop decision-making strategies in complex unpredictable conditions
PO 15	To assess environmental risks in the conditions of insufficient information and conflicting requirements
PO 16	To choose the optimal management strategy and/or nature management depending on ecological conditions
PO 17	To critically comprehend theories, principles, methods and concepts from various subject areas to solve practical problems and problems of ecology
PO 18	To be able to use modern methods of processing and interpretation of information in environmental research
PO 19	To be able to independently plan the implementation of an research task and formulate conclusions based on its results
PO 20	To master the basics of carrying out environmental studies and ecological expert assessment of the impact on the environment
PO 21	To know up-to-date approaches to the organization of environmentally cleaner production, reorganization and reconstruction of existing production from the standpoint of resource conservation, taking into account the life cycle of the product
PO 22	To analyze the results of environmental control of companies, assess the engineering and technical level of environmental protection measures against the harmful effects of production
PO 23	Using scientific and technical information, regulations, professional knowledge, to apply methods of process control, to manage equipment that protects water bodies, atmosphere, soil and subsoil from pollution and harmful effects
PO 24	Based on the regulations of environmental standardization and certification, to work with Ukrainian and foreign standards and certification requirements to develop appropriate professional recommendations
PO 25	To master up-to-date information technology
<b>8 – Resource support for program implementation</b>	
Staffing	In accordance with the staffing requirements to support educational activities for the respective HE level, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 in the current edition: Involvement of professional practitioners and lecturers from other higher education institutions in teaching professional-oriented disciplines. Staffing complies with applicable license requirements.

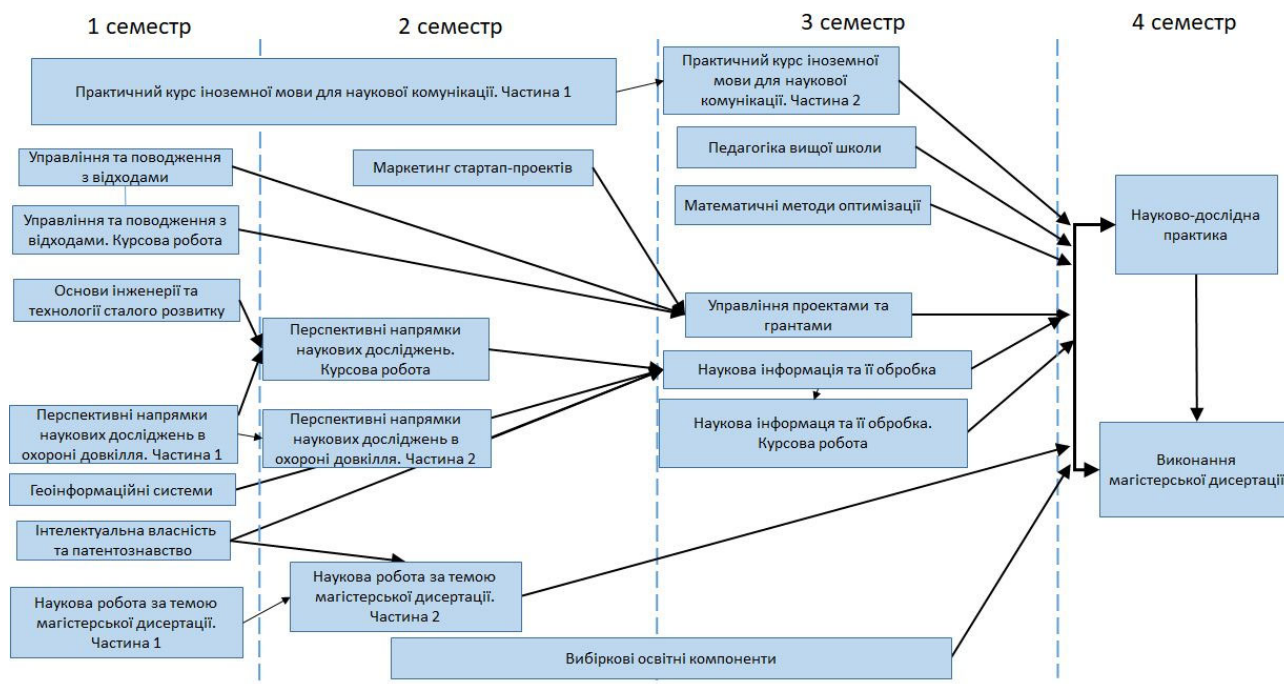


Material-technical support	<p>In accordance with the technological requirements for material-technical support of educational activities of the respective HE level, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 in the current edition:</p> <p>A specialized laboratory, a complex of laboratories of the department and the auditorium, equipped with technical means of demonstration, including multimedia systems, are available for research.</p> <p>There are scientific and educational complexes "Environmentally friendly technologies for humans" and "Surface chemistry and physics" of Igor Sikorsky Kyiv Polytechnic Institute and the Department of Chemistry of the National Academy of Sciences of Ukraine, on the basis of which students gain experience in solving environmental problems. There is an option of remote information exchange and interaction with teachers.</p> <p>Meets license requirements.</p>
Information and educational-methodical support	<p>In accordance with the technological requirements for training-methodological and informational support of education activities of the respective HE level, approved by the Resolution of the Cabinet of Ministers of Ukraine dated 30.12.2015 № 1187 in the current edition:</p> <p>The use of the library at the department and the Scientific and Technical Library of Igor Sikorsky Kyiv Polytechnic Institute.</p>
<b>9 – Academic mobility</b>	
National credit mobility	Possibility of making agreements on academic mobility in accordance with the current legislation of Ukraine in the field of the higher education.
International credit mobility	Erasmus+KA1 academic mobility program, participation in the university's academic mobility programs on a competitive basis.
Training of foreign HE applicants	Education is conducted in English in separate academic groups, while Ukrainian is studied as a foreign language; or in Ukrainian in joint groups with Ukrainian applicants.

## 2. LIST OF COMPONENTS OF THE EDUCATIONAL PROGRAM

Code	Components of the educational program (disciplines, course projects (works), practice, qualifying work)	ECTS Credits	Final examination
<b>1. COMPULSORY educational components</b>			
<b>1.1. General training cycle</b>			
GC 01	Intellectual Property and Patenting	3	final test
GC 02	Fundamentals of Engineering and Technology of Sustainable Development	2	final test
GC 03.1	Practical Course in Foreign Language for Scientific Communication. Part 1	3	final test
GC 03.2	Practical Course in Foreign Language for Scientific Communication. Part 2	1,5	final test
GC 04	Marketing of Start-Up Projects	3	final test
GC 05	Higher School Pedagogy	2	final test
GC 06	Mathematical Optimization Methods	4	exam
<b>1.2. Vocational training cycle</b>			
VC 01	Waste Management	6	exam
VC 02	Coursework in Waste Management	1	final test
VC 03	Geographic Information Systems	4	exam
VC 04.1	Perspective Research Directions in Environmental Protection. Part 1. Analysis of Actual Problems of Environmental Protection	10,5	exam
VC 04.2	Perspective Research Directions in Environmental Protection. Part 2. Theoretical and Experimental Solution of Scientific Problems in Environmental Safety	3,5	final test
VC 05	Coursework in Perspective Research Directions in Environmental Protection	1	final test
VC 06	Project Management and Grants	4,5	exam
VC 07	Scientific Information and its Processing	4	final test
VC 08	Coursework in Scientific Information and its Processing	1	final test
<b>Research (scientific) component</b>			
VC 09.1	Scientific Work on the Topic of Master's Thesis. Part 1. Fundamentals of Scientific Research	2	final test
VC 09.2	Scientific Work on the Topic of Master's Thesis. Part 2. Scientific and Research Work on the Topic of Master's Thesis	8	final test
VC 10	Scientific and Research Practice	9	final test
VC 11	Master's Thesis	17	defense
<b>2. OPTIONAL educational components</b>			
<b>Vocational training cycle</b>			
VO 01	Educational component 1 F-Catalog	5	exam
VO 02	Educational component 2 F-Catalog	5	exam
VO 03	Educational component 3 F-Catalog	5	exam
VO 04	Educational component 4 F-Catalog	4	залік
VO 05	Educational component 5 F-Catalog	4	залік
VO 06	Educational component 6 F-Catalog	7	exam
Total in <b>compulsory components:</b>		<b>90</b>	
Total in <b>optional components:</b>		<b>30</b>	
Total in educational components <b>that ensure the acquisition of competencies defined by the SHE</b>		<b>60</b>	
<b>TOTAL in EDUCATIONAL PROGRAM</b>		<b>120</b>	

### 3. STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROGRAM



### 4. FORM OF FINAL EXAMINATION OF HIGHER EDUCATION APPLICANTS

Forms of final examination of higher education applicants	Attestation is carried out in the form of public defense of qualifying work.
Requirements to qualifying work	<p>The qualifying work involves the independent solution of a complex problem in the field of ecology, environmental protection and/or balanced nature management, which is accompanied by research and/or the application of innovative approaches.</p> <p>The main results of the qualifying work must be approved, published and checked for plagiarism.</p> <p>The defense of the qualifying work is completed with the issuance of a document of the established form on awarding the graduate a Master's degree with the qualification: Master of Environmental Studies.</p> <p>The qualifying work must be posted on the website of the higher education institution or its structural subdivision <a href="https://eco-paper.kpi.ua/">https://eco-paper.kpi.ua/</a> (abstract), or in the repository of the higher education institution (Electronic Archive of Scientific and Educational Materials of Igor Sikorsky Kyiv Polytechnic Institute (ELAKPI)).</p>

**5. MATRIX OF CORRESPONDENCE OF PROGRAM COMPETENCIES TO THE COMPONENTS OF THE EDUCATIONAL PROGRAM**

	GC 01	GC 02	GC 03	GC 04	GC 05	GC 06	VC 01	VC 02	VC 03	VC 04	VC 05	VC 06	VC 07	VC 08	VC 09	VC 10	VC 11
C 01		+							+	+	+		+	+	+	+	+
C 02		+		+												+	+
C 03	+								+	+	+	+		+	+	+	+
C 04		+		+								+					
C 05			+									+					
C 06	+					+			+	+	+		+	+	+	+	+
C 07				+	+							+			+	+	
C 08	+									+	+			+	+	+	
C 09	+			+					+	+	+			+	+	+	+
C 10									+			+					+
C 11	+									+	+	+		+	+	+	
C 12		+							+							+	+
C 13	+											+				+	+
C 14				+								+					+
C 15						+	+	+	+	+	+		+		+	+	
C 16	+							+			+	+		+	+	+	+
C 17		+						+			+	+			+		
C 18		+					+	+		+	+				+	+	+
C 19							+	+							+	+	+
C 20										+	+				+	+	+
C 21												+					
C 22									+								
C 23									+				+	+	+	+	+

**6. MATRIX OF PROVIDING OF PROGRAM LEARNING OUTCOMES  
BY RELEVANT COMPONENTS OF THE EDUCATIONAL  
PROGRAM**

	GC 01	GC 02	GC 03	GC 04	GC 05	GC 06	VC 01	VC 02	VC 03	VC 04	VC 05	VC 06	VC 07	VC 08	VC 09	VC 10	VC 11
PO 1	+	+		+					+	+	+	+	+	+	+	+	+
PO 2	+	+		+					+	+	+		+	+	+	+	+
PO 3	+	+		+					+	+	+		+	+	+	+	+
PO 4	+	+		+					+			+				+	+
PO 5	+			+	+					+	+	+		+	+	+	+
PO 6	+	+							+	+	+			+	+	+	+
PO 7	+		+					+			+	+		+	+	+	+
PO 8	+					+			+	+	+	+	+	+	+	+	+
PO 9		+		+	+							+			+	+	+
PO 10		+		+		+	+	+	+	+	+		+		+	+	+
PO 11	+		+			+	+	+	+	+	+	+	+	+	+	+	+
PO 12		+				+	+	+	+	+	+		+		+	+	+
PO 13		+				+	+	+	+	+	+		+		+	+	+
PO 14	+	+						+	+	+	+	+		+	+	+	+
PO 15		+		+			+	+		+	+				+	+	+
PO 16	+	+		+			+	+	+	+	+	+		+	+	+	+
PO 17	+								+	+	+	+		+	+	+	+
PO 18	+	+				+			+	+	+		+	+	+	+	+
PO 19	+	+							+	+	+	+		+	+	+	+
PO 20	+	+		+				+		+	+	+		+	+	+	
PO 21										+	+	+			+	+	+
PO 22										+	+				+	+	+
PO 23							+	+							+	+	+
PO 24							+										+
PO 25									+				+				+