3. Educational program

Information Technology and Business Analytics (Data Science) (bachelor's degree) – the guarantor of the educational program Kulazhenko V.V., Candidate of Economic Sciences, Associate Professor, Associate Professor of the Department of Digital Economy and System Analysis.

3.1. Profile of the educational program in the specialty 124 "System Analysis" with a specialization in "Information Technology and Business Analytics (Data Science)"

1 –General information	
Full name of the institution of higher education and structural subdivision	Kyiv National University of Trade and Economics Faculty of Information Technologies Department of Digital Economy and System Analysis
Higher education degree and the name of the qualification in the language of the original	Higher education degree – Bachelor Speciality “System Analysis” Specialization “Information Technology and Business Analytics (Data Science)”
The official name of the educational program	“Information Technology and Business Analytics (Data Science)”
Type of diploma and volume of educational program	Bachelor's degree diploma, unitary, 240 ECTS credits Term of studies - 3 years 10 months
Availability of accreditation	The initial accreditation is scheduled for 2021
Cycle / Level	NQF of Ukraine – the 6th level FQ for EHEA – the first cycle EQF for LLL – the 6th level
Prerequisites	Full secondary education
Language (s) of teaching	Ukrainian
The duration of the educational program	4 years
Internet address of the permanent placing of the educational program	https://knute.edu.ua

2 –The purpose of the educational program	
To provide students with theoretical knowledge and practical skills sufficient to successfully perform comprehensive business analysis, forecasting, optimization and decision making in complex systems of various natures based on system methodology Data Science, artificial intelligence, machine learning, other mathematical methods and software using modern information technologies, fundamental and applied methods of business analysis to solve problems of data analysis in various fields of science, technology, finance, socio-economic and political spheres, global and local environmental problems and the national economy as a whole.	
3 - Characteristics of the educational program	
Subject area (branch of knowledge, specialty, specialization (if any))	Branch of Knowledge 12 "Information Technologies" Specialty 124 "System Analysis" Specialization "Information technology and business analytics (Data Science)"
Orientation of the educational program	Educational and professional. The emphasis is on readiness to work and acquire skills and knowledge in information technologies, mathematical and computer modeling of data of various nature, tasks of forecasting, optimization, system analysis and decision making, intellectual analysis and synthesis of data and knowledge.
The main focus of the educational program and specialization	Special education in business analysis and information technology, ability to intelligent analysis, forecasting, decision making in complex systems of various nature based on the system methodology of Data Science. *Keywords:* data analysis, artificial intelligence, expert systems, machine learning, data of systems of different nature (informational, economic, financial, social, political, technical, organizational, ecological, etc.), system approach, system analysis, mathematical modeling, computer modeling, mathematical methods, information systems, information technology, decision making, forecasting, business intelligence, Data Science.
Peculiarities of the program	In-depth study and knowledge of promising areas of data mining, computer modeling of processes, artificial intelligence systems, expert decision-making systems at different stages of creation and application of information systems.
4 – Suitability of graduates for employment and further education	

<table>
<tr><td>Suitability of graduates for employment</td><td>Jobs in the field of information technology, communication and management of IT projects: IT companies, financial companies, consulting companies, government agencies.
The list of economic activities that a bachelor is able to perform in the educational program "Information Technology and Business Analytics (Data Science)":
<table>
<tr><td>NACE code DK 009:2010</td><td>Name of the economic activity</td></tr>
<tr><td>62.02</td><td>Consulting on informatization</td></tr>
<tr><td>63.11</td><td>Data processing, posting information on websites and related activities</td></tr>
<tr><td>63.12</td><td>Web portals</td></tr>
</table>
Positions that a bachelor is able to hold in the educational program "Information Technology and Business Analytics (Data Science)":
<table>
<tr><td>DC code 003:2010</td><td>Name of profession</td></tr>
<tr><td>1226.2</td><td>Head of a structural unit (information security)</td></tr>
<tr><td>2121.2</td><td>Mathematician-analyst in operations research</td></tr>
<tr><td>2131.1</td><td>Researcher-consultant (computer systems)</td></tr>
<tr><td>2131.2</td><td>Data administrator</td></tr>
<tr><td>2131.2</td><td>Computer data bank analyst</td></tr>
<tr><td>2149.2</td><td>Systems analyst</td></tr>
<tr><td>2412.2</td><td>Analyst in the field of professional employment</td></tr>
<tr><td>2433.1</td><td>Researcher-consultant (information analytics)</td></tr>
<tr><td>2433.2</td><td>Consolidated information analyst</td></tr>
<tr><td>3121</td><td>Information technology specialist</td></tr>
</table></td></tr>
<tr><td>Further training</td><td>Continuation of education at the second (master's) level of higher education in master's educational programs in the field of knowledge "Information Technology" and in interdisciplinary programs close to systems analysis.</td></tr>
<tr><td colspan="2">5 –Teaching and evaluation</td></tr>
<tr><td>Teaching and evaluation</td><td>Problem-oriented learning, self-learning, learning through practical training.</td></tr>
<tr><td>Evaluation</td><td>Current control, written exams, defense of term papers, defense of final qualifying work. The assessment is carried</td></tr>
</table>

	out in accordance with the "Regulations on the assessment of the learning outcomes of students and postgraduates of the KNUTE", "Regulations on the organization of the educational process of students"
6 –Program competencies	
Integral competence	The ability to solve complex specialized problems and practical problems of *systems analysis* in professional activities or in the learning process, involving the application of theoretical principles and *methods of systems analysis and information technology* and characterized by complexity and uncertainty of conditions.
General competences (GC)	C01. The ability to abstract thinking, analysis and synthesis C02. The ability to apply knowledge in practical situations C03. The ability to plan and manage time C04. The knowledge and understanding of the subject area and understanding of professional activity C05. The ability to communicate in the state language orally and in writing C06. The ability to communicate in a foreign language C07.The ability to search, process and analyze information from various sources C08. The ability to be critical and self-critical C09. The ability to adapt and act in a new situation C10. The ability to work autonomously C11.The ability to generate new ideas (creativity) C12. The ability to work in a team C13. The ability to work in an international context C14. The ability to evaluate and ensure the quality of work performed C15. The ability to exercise the rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine. C16. The ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies. active recreation and a healthy lifestyle.

Professional competences of the speciality (PC)	PC17. The ability to use systems analysis as a modern interdisciplinary methodology based on applied mathematical methods and modern information technologies and focused on solving problems of analysis and synthesis of technical, economic, social, environmental and other complex systems. PC18. The ability to formalize problems described in natural language, including via mathematical methods, to apply general approaches to mathematical modeling of specific processes. PC19. The ability to build mathematically correct models of static and dynamic processes and systems with concentrated and distributed parameters taking into account the uncertainty of external and internal factors. PC20. The ability to identify the main factors influencing the development of physical, economic, social processes, to distinguish stochastic and indeterminate indicators, to formulate them in the form of random or fuzzy variables, vectors, processes and to investigate the relationships between them. PC21. The ability to formulate optimization problems in the design of control systems and decision-making, namely: mathematical models, optimality criteria, constraints, management objectives; to choose rational methods and algorithms for solving optimization and optimal control problems. PC22. The ability to computer implementation of mathematical models of real systems and processes; design, to apply and maintain software tools for modeling, decision making, optimization, information processing, data mining. PC23. The ability to use modern information technologies for computer implementation of mathematical models and prediction of behavior of specific systems, namely: object-oriented approach in the design of complex systems of different nature, applied mathematical packages, application of databases and knowledge. PC24. The ability to organize work on the analysis and design of complex systems, the creation of appropriate information technology and software. PC25. The ability to present mathematical arguments and conclusions from them with clarity and accuracy and in forms that are suitable for the audience both orally and in the written form. PC26. The ability to develop experimental and observational studies and analyze data obtained in

	them. PC27. The ability to analyze systematically their professional and social activities, evaluate the experience gained *PC28. The ability to understand and use skillfully the theory and methods of Data Science.* *PC29. The ability to develop and implement business intelligence models using computer modeling.* *PC30. The ability to use data analysis software (programming languages, analytical platforms) for mathematical and methodological research*
7 – Program outcomes of the training	
	PO 01. To know and to be able to apply in practice differential and integral calculus, Fourier series and integral, analytic geometry, linear algebra and vector analysis, functional analysis and discrete mathematics to the extent necessary to solve typical problems of systems analysis. PO 02. To be able to use standard schemes for solving combinatorial and logical problems formulated in natural language, use classical algorithms to check the properties and classification of objects, sets, relations, graphs, groups, rings, lattices, Boolean functions, etc. PO 03. To be able to determine the probability distributions of stochastic indicators and factors influencing the characteristics of the studied processes, investigate the properties and find the characteristics of multidimensional random vectors and use them to solve applied problems, formalize stochastic indicators and factors in the form of random variables, vectors, processes. PO 04. To know and to be able to apply basic methods of qualitative analysis and integration of ordinary differential equations and systems, differential equations in partial derivatives, including equations of mathematical physics. PO 05. To know the basic principles of the theory of metric spaces, Lebesgue theory of measure and integral, the theory of bounded linear operators in Banach and Hilbert spaces, to apply techniques and methods of functional analysis to solve problems of control of complex processes under uncertainty.

	PO 06. To know and to be able to apply the basic methods of setting and solving problems of systems analysis in conditions of uncertainty of goals, external conditions and conflicts. PO 07. To know the basics of optimization theory, optimal control, decision theory, be able to apply them in practice to solve applied control problems and design complex systems. PO 08. To have modern methods of developing programs and software packages and making optimal decisions about the composition of software, algorithms, procedures and operations. PO 09. To be able to create efficient algorithms for computational problems of system analysis and decision support systems. PO 10. To know the architecture of modern computer systems and computer networks. PO 11. To know and to be able to apply in practice database management systems and information systems. PO 12. To apply methods and tools for working with data and knowledge, methods of mathematical, logical-semantic, object and simulation modeling, technology of system and statistical analysis. PO 13. To design, implement, test, implement, maintain, operate software tools for working with data and knowledge in computer systems and networks. PO 14. To understand and apply in practice the methods of statistical modeling and forecasting, evaluate the original data. PO 15. To understand Ukrainian and foreign languages at a level sufficient for processing professional information and literature sources, professional oral and written communication, writing texts on professional topics. PO 16. To understand and realize the rights and responsibilities as a member of society, to realize the values of a free democratic society, the rule of law, human and civil rights and freedoms in Ukraine. PO 17. To preserve and increase the achievements and values of society based on understanding the place of the subject area in the general system of knowledge, use different types and forms of physical activity to lead a healthy lifestyle. *PO 18. To have sufficient knowledge of mathematical models and methods of data analysis, modeling languages*

	and software to perform practical tasks of business analysis. *PO 19. To know mathematical methods for developing and researching algorithms for solving business intelligence problems, modeling objects and processes, developing algorithms for systems operation.*
8 –Resource support for the implementation of the program	
Personnel support	Specialists who train bachelors in the educational program "Information Technology and Business Analytics (Data Science)" must have professional knowledge and professional skills in data analysis, mathematical modeling and modern information technology. The participation of foreign specialists and practitioners in teaching of disciplines of the training cycle is possible.
Material and technical support	The basis of the material and technical support is made up of specialized computer laboratories with modern hardware and software resources, providing high-quality training for bachelors in the educational program "Information Technology and Business Analytics (Data Science)".
Information and educational and methodical support	General scientific and special sources of information on system analysis and data analysis, educational and methodical and monographic literature, information resources of the distance learning system and the Internet.
9 –Academic mobility	
National credit mobility	National credit mobility is carried out in accordance with the concluded agreements on academic mobility.
International credit mobility	International credit mobility is realized through the conclusion of agreements on international academic mobility (Erasmus +), double graduation, long-term international projects involving student education, issuance of a double diploma, etc.
Teaching foreign applicants for higher education	Conditions and features of the educational program in the context of teaching foreign citizens: knowledge of the Ukrainian language at a level not lower than B1.

3.2. The list of components of the educational program and their logical consistency

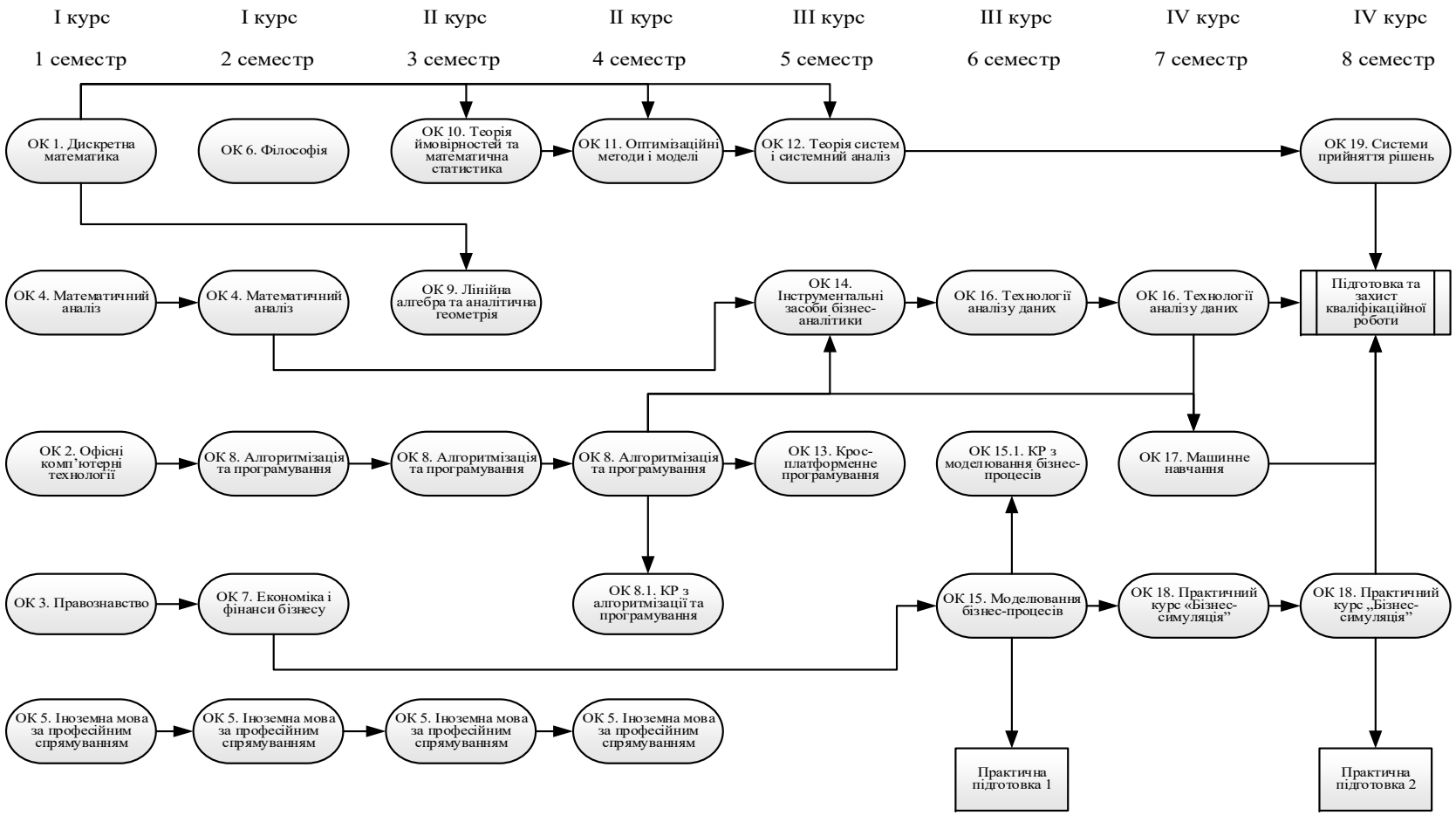
Code N / A	Components of the educational program (academic disciplines, course projects (works), practice, qualification work)	Amount of credits
Compulsory components of the EP		

Code N / A	Components of the educational program (academic disciplines, course projects (works), practice, qualification work)	Amount of credits
CC 1	Discrete Mathematics	6
CC 2	Office computer technologies	6
CC 3	Science of law	6
CC 4	Mathematical analysis	12
CC 5	Foreign language for professional orientation	24
CC 6	Philosophy	6
CC 7	Economics and business finance	18
CC 8	Algorithmization and programming	
CC 8.1	Course work on algorithmization and programming	6
CC 9	Linear algebra and analytic geometry	6
CC 10	Probability theory and mathematical statistics	6
CC 11	Optimization methods and models	6
CC 12	Systems theory and systems analysis	6
CC 13	Cross-platform programming	6
CC 14	Business analytics tools	9
CC 15	Business process modeling	12
CC 15.1	Course work on business process modeling	
CC 16	Data analysis technologies	6
CC 17	Machine training	9
CC 18	Practical course "Business Simulation"	6
CC 19	Decision making systems	6
Total volume of compulsory components:		**162**
Selective components of the EP		
SC1.	Life safety	6
SC 2.	Business technologies	6
SC 3.	Accounting	6
SC 4.	Economic theory	6
SC 5.	Economic analysis	6
SC 6.	Immitation modeling	6
SC 7.	Engineering and computer graphics	6
SC 8.	Intellectual Property	6
SC 9.	Internet technologies in business	6
SC 10.	Information law	6
SC 11.	Information systems and technologies in economics	6
SC 12.	History of Ukraine	6
SC 13.	History of Ukrainian Culture	6
SC 14.	Computer data visualization systems	6
SC 15.	Computer data processing technologies	6
SC 16.	Cultural heritage of Ukraine	6
SC 17.	Marketing analysis	6
SC 18.	Data modeling in conditions of uncertainty	6
SC 19.	National interests in world geopolitics and geoeconomics	6

Code N / A	Components of the educational program (academic disciplines, course projects (works), practice, qualification work)	Amount of credits
SC 20.	The art of rhetoric	6
SC 21.	Organization of computer networks	6
SC 22.	Forecasting of socio-economic processes	6
SC 23.	Project analysis	6
SC 24.	Psychology	6
SC 25.	Religious studies	6
SC 26.	World culture	6
SC 27.	Strategic analysis	6
SC 28.	Web application development technologies	6
SC 29.	Technology of design and administration of databases and data warehouses	6
SC 30 .	Technology for creating distributed databases and knowledge	6
SC 31.	The Ukrainian language (for professional orientation)	6
SC 32.	Financial analysis	6
SC 33.	Cloud and GRID technologies	6
SC 34.	Digital systems and technologies	6
SC 35.	Numerical Methods	6
SC 36.	Numerical programming methods	6
SC 37.	Digital technology in business	6
SC 38.	Java tools for distributed data processing	6
The total amount of selective components:		**60**
Practical training		
Internship 1		3
Internship 2		6
Total		**9**
Attestation		
Preparation for the attestation		3
Preparation of the final qualification work and its defense		6
Total		**9**
TOTAL VOLUME OF EDUCATIONAL PROGRAM		**240**

An exam is the form of final control for all components of the educational program.

3.2.2 Structural and logical scheme of the EP



Year 1 Semester 1

Year 1 Semester 2

Year 2 Semester 3

Year 2 Semester 4

Year 3 Semester 5

Year 3 Semester 6

Year 4 Semester 7

Year 1 Semester 8

CC1. Discrete Mathematics

CC 6. Philosophy

CC 10. Probability theory and mathematical statistics

CC 11. Optimization methods and models

CC 12. Systems theory and systems analysis

CC 19. Decision making systems

CC 4. Mathematical analysis

CC. 9 Linear algebra and analytic geometry

CC 14. Business analytics tools

CC 16. Data analysis technologies

Preparation and defense of a course work

CC. 2 Office computer technologies

CC 8. Algorithmization and programming

CC 13. Cross-platform programming

CC.15.1. Course work on business process modeling

CC. 17 Machine training

CC. 3 Science of law

CC. 7 Business economics and finance

CC 8.1. Course work on algorithmization and programming

CC. 15. Business process modeling

CC 18. Practical course "Business Simulation"

CC 5. Foreign language for professional orientation

Internship 1

Internship 2

3.3. Form of attestation of applicants for higher education

Attestation of graduates of the educational program "Digital Economics", Specialty 051 "Economics" is carried out in the form of defense of the final qualification work and ends with the issuance of a standard document on awarding a master's degree with qualification: higher education master's degree in "Economics" specialization "Digital Economics".

3.4. Matrix of compliance of program competencies to the compulsory components of the educational program

	Component / Competences	CC1	CC 2	CC3	CC4	CC 5	CC 6	CC 7	CC 7.1	CC 8	CC 9	CC 10	CC 11	CC 12	CC 13	CC 14	CC 15	CC 15.1	CC 16	CC 17	CC 18	CC 19
General competences	C01	+			+		+	+	+	+	+	+		+	+		+	+	+			+
	C02							+	+			+	+	+	+		+	+	+	+	+	+
	C03											+	+							+		
	C04		+											+			+			+		
	C05								+					+				+				
	C06					+																
	C07	+	+		+			+	+	+	+			+			+	+		+	+	
	C08						+														+	
	C09															+				+	+	
	C10		+						+						+			+		+	+	
	C11						+									+						
	C12																		+	+	+	
	C13					+														+		
	C14		+									+							+			
	C15			+																		
	C16						+															
Special (professional, subject) competencies	C17											+		+			+	+			+	
	C18	+			+				+	+	+	+		+			+	+	+	+	+	+
	C19	+			+					+	+										+	
	C20										+					+					+	
	C21		+									+									+	
	C22		+					+	+						+	+	+	+	+	+	+	+
	C23		+					+	+			+		+	+	+	+	+		+	+	+
	C24							+	+						+							
	C25	+			+					+	+											
	C26								+								+	+				+
	C27													+						+		
	C28							+	+							+	+	+		+		+
	C29																+	+		+		+
	C30							+	+						+	+	+	+		+		+

3.6. Matrix of correspondence of program competencies to the selected components of the educational program

	SC1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8	SC 9	SC 10	SC 11.	SC 12	SC 13
GC1.				+	+	+							
GC 2.	+	+		+							+	+	
GC 3.													+
GC4					+		+	+	+	+			
GC 5.			+		+	+							
GC 6.			+	+									
GC 7.					+								
GC 8.	+	+					+	+	+	+	+	+	+
PC 1											+	+	+
PC 2						+							
PC 3		+			+								
PC 4			+		+	+	+	+	+	+			
PC 5				+							+	+	+
PC 6	+	+											
PC 7		+											
PC 8		+					+	+	+	+	+		+
PC 9	+			+									
PC 10											+	+	+
PC 11	+			+									
PC *12*	+			+									
PC *13*			+		+	+						+	

PC *14*	+	+										
PC *15*		+										

3.7. Matrix for ensuring program learning outcomes by relevant selective components of the educational program

Components / Program learning outcomes	SC 1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8	SC 9	SC 10	SC 11	SC 12	SC 13	SC 14	SC 15	SC 16	SC 17	SC 18	SC 19	SC 20	SC 21	SC 22	SC 23	SC 24	SC 25	SC 26	SC 27	SC 28	SC 29	SC 30	SC 31	SC 32	SC 33	SC 34	SC 35	SC 36	SC 37	SC 38
PO 01						+	+																															
PO 02															+															+								
PO 03																		+																			
PO 04						+																															
PO 05																		+																			
PO 06																		+																			
PO 07											+											+							+	+							
PO 08							+							+	+						+							+					+		+		+
PO 09		+				+			+																								+		+	+	+	
PO 10									+												+												+					
PO 11									+		+																		+	+			+	+				+
PO 12					+	+								+			+	+					+				+				+			+			
PO 13						+	+		+		+			+	+						+	+						+	+	+		+	+	+	+	+	+
PO 14			+			+												+				+															
PO 15																															+							
PO 16				+				+		+									+					+	+												
PO 17	+											+	+			+			+	+						+											
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