ХАЛЫҚАРАЛЫҚ УНИВЕРСИТЕТІ
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ
INTERNATIONAL UNIVERSITY

Faculty of Digital Transformation
Department of "Information Systems"

APPROVED BY
Vice-rector for academic affairs,
International Information
Technology University JSC
_____ Umarov T.F.
"___" _____2021

8D06101
(Code of Academic Program)

Clever systems
(Name of Academic Program)

CATALOGUE OF ELECTIVE DISCIPLINES

2021

2021

The catalogue of elective disciplines for the specialty/AP _____

_____

is developed on the basis of the working curriculum of the specialty/AP.

The catalogue of elective disciplines was discussed at a meeting of the department Information Systems

minutes No. 7 from "5" 03. 2021.

Head of Department _____ Kassymova A.B., PhD, assoc.prof.
signature Full name, position, degree

CED compiler _____ Aitim A.K.,senior-lecturer, master
signature Full name, position, degree

The catalogue of elective disciplines was approved at a meeting of the Academic Council of "International Information Technology University" JSC minutes No. 4 from "30" March 2021.

Director of the Department of
Postgraduate Education _____ Bektemysova G.U.
signature Full name, position, degree

1 TERMS AND ABBREVIATIONS

1. 1 Academic program is a single set of basic characteristics of education, including goals, results and content of training, the organization of educational process, ways and methods for their implementation and criteria for assessing learning outcomes.

The content of academic program of higher education consists of three cycles of disciplines - general education disciplines (hereinafter - GED), basic disciplines (hereinafter - BD) and core disciplines (hereinafter - CD).

The cycle of GED includes disciplines of the compulsory component (hereinafter - CC), the university component (hereinafter - UC) and (or) the component of choice (hereinafter - COC). BD and CD include disciplines of UC and COC.

1. 2 Catalogue of elective disciplines (CED) is a systematic annotated list of all COC disciplines, for the entire training period, containing a brief description indicating the purpose of study, a summary of main sections and expected learning outcomes. CED reflects the prerequisites and postrequisites of each academic discipline. It should provide the students with the possibility of an alternative choice of elective disciplines for the formation of an individual educational trajectory.

On the basis of academic program and CED, the students develop individual curricula with the help of advisers.

1. 3 Individual curriculum (IC) is a curriculum formed by the students independently with the help of an adviser for each academic year on the basis of the academic program, the catalogue of elective disciplines or modules;

IC defines an individual educational trajectory of each student separately. It includes disciplines and types of educational activities (internship, experimental research, forms of final certification) of the compulsory component (CC), the university component (UC) and the component of choice (COC).

1. 4 Advisor is a teacher who performs the functions of an academic mentor of a student (according to the appropriate academic program), and assists in choosing a learning path (creating an individual curriculum) and mastering the academic program during the training period.

1. 5 The university component is a list of compulsory educational disciplines determined by the university independently for the mastering of the academic program.

1. 6 The component of choice is a list of academic disciplines and the corresponding minimum amounts of academic credits offered by the university and independently chosen by students in any academic period, taking into account their prerequisites and postrequisites.

1. 7 Elective disciplines are educational disciplines that are a part of the university component and the component of choice in the framework of established academic credits, introduced by organizations of education reflecting the individual preparation of students and taking into account the specifics of socio-economic development, the needs of a particular region and established scientific schools.

1. 8 Postrequisites are the disciplines and (or) modules and other types of academic work, the study of which requires knowledge, skills and competencies acquired at the end of the study of this discipline and (or) modules;

1. 9 Prerequisites are the disciplines and (or) modules and other types of educational work containing knowledge, abilities, skills and competencies necessary for the mastering of the studied discipline and (or) modules;

1. 10 Competencies are the ability of the practical use of acquired knowledge and skills in professional activities.

2 ELECTIVE DISCIPLINES

№	Cycle of discipline	Code of discipline	Name of discipline	Semester	Number of credits	Prerequisites
1 year						
1	BD	TIN 7203	Theoretical Computer Engineering	1	4	None
2	BD	IAD 7204	Intelligent data analysis of IS	1	4	None
3	CD	SFT7101	Analysis Methods and Big Data Processing	1	5	None
4	CD	NSP 7302	Deep learning methods	1	3	None

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of discipline	
Code of discipline	TIN 7203
Name of discipline	Theoretical Computer Engineering
Number of credits (ECTS)	4
Course, semester	1, 1
Department	Information Systems
Course author (s)	Sinchev Bakhtgerei Kuspanovich, Professor, d.t.s.
Prerequisites	None
Postrequisites	preparation of PhD thesis
The aim of study of a discipline	The formation and development of general and professional competencies for a doctoral candidate in the field of “Theoretical Computer Engineering”, who will be able to provide solutions to complex problems and practical problems in the design, construction and configuration of computer systems, use and implement computer engineering technologies.
Brief course description (main sections)	This course provides a challenging introduction to some of the central ideas of theoretical computer science. It attempts to present a vision of "computer science beyond computers": that is, CS as a set of mathematical tools for understanding complex systems such as universes and minds. Beginning in antiquity- with Euclid's algorithm and other ancient examples of computational thinking - the course will progress rapidly through propositional logic, Turing machines and computability, finite automata, Gödel's theorems, efficient algorithms and reducibility, NP-completeness, the P versus NP problem, decision trees and other concrete computational models, the power of randomness, cryptography and one-way functions, computational theories of learning, interactive proofs, and quantum computing and the physical limits of computation.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	By the end of the course, the students will obtain following learning outcomes: 1. to analyze and carry out the classification of types of information; 2. to conduct a comparative analysis of the ways of forming analog and discrete forms of information; 3. compare the main approaches to the presentation of various types of information; 4. analyze and use forecast information as the basis for a preliminary assessment of the consequences of decisions; 5. analyze and substantively interpret the results obtained with their further application in scientific research.

Description of discipline	
Code of discipline	IAD 7204
Name of discipline	Intelligent data analysis of IS
Number of credits (ECTS)	4
Course, semester	1, 1
Department	Information Systems
Course author (s)	Kuandykov A.A., professor, d.t.s.
Prerequisites	None
Postrequisites	preparation of PhD thesis
The aim of study of a discipline	The discipline "Data Mining in IP" has as its goal: - the formation of doctoral students ideas about the types of tasks, emerging in the field of data mining. - the study of the main approaches and algorithms for solving data analysis problems and the features of their application to solving real problems. - Doctoral students gain the skills to identify, formalize and successfully solve practical problems of data analysis that arise in the process of their professional activities. - gaining practical skills in working with existing software packages for data analysis.
Brief course description (main sections)	This course outlines the basis of data analysis methods such as methods of classification, modeling and forecasting, based on the use of decision trees, artificial neural networks, genetic algorithms, evolutionary programming, associative memory, fuzzy logic. Students will learn data analysis methods including statistical methods: descriptive analysis, correlation and regression analysis, factor analysis, variance analysis, component analysis, discriminant analysis, time series analysis, survival analysis, link analysis. It will help them to obtain some a priori notions about the analyzed data. One of the most important purposes of data analysis methods is to visualize the results of calculations (visualization). The complexity and variety of the Intelligent data analysis methods require the creation of specialized end-user tools for solving typical problems of information analysis in specific areas. Because these tools are used in complex multi-functional decision support systems, they must be easily integrated into such systems. Intelligent data analysis systems are used in research and education, law enforcement, production, health care and many other areas. Particularly broadly, the Intelligent data analysis technology is used in business applications.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	After completing this course, students will be able to: 1. analyze and apply following: classification tasks; regression problems; prediction tasks; clustering tasks; the task of defining relationships; sequence analysis; analysis of deviations. 2. apply the software products of the following classes: specialized "boxed" software products for intellectual analysis; mathematical packages; electronic tables (and various kinds of configurations and superstructures over them); tools integrated into database management systems (DBMS); other software products. 3. construct the econometric models, objects, phenomena and processes; 4. build the standard theoretical models and algorithms based on the description of situations, as well as to analyze and interpret the results in a meaningful way. 5. enhance an ability to understand the task by gaining detailed knowledge of paradigms and programming methodologies, features of

	programming languages for general and special purposes, the most widely used programming tools.

Description of discipline	
Code of discipline	SFT7101
Name of discipline	Analysis Methods and Big Data Processing
Number of credits (ECTS)	5
Course, semester	1, 1
Department	Information Systems
Course author (s)	Moldagulova A.N., PhD, assoc.prof
Prerequisites	None
Postrequisites	preparation of PhD thesis
The aim of study of a discipline	The aim of the discipline is the development by a doctoral student of skills in developing systems with a high degree of scalability, which can receive, store and analyze large volumes of unstructured data in batch mode and / or in real time
Brief course description (main sections)	The recent explosion of social media and the computerization of every aspect of economic activity resulted in creation of large volumes of mostly unstructured data: web logs, videos, speech recordings, photographs, e-mails, Tweets, and similar. In a parallel development, computers keep getting ever more powerful and storage ever cheaper. Today, we have the ability to reliably and cheaply store huge volumes of data, efficiently analyze them, and extract business and socially relevant information. This course introduces you to several key IT technologies that you will be able to use to manipulate, store, and analyze big data. We will look at the basic tools for statistical analysis, R, and a few key methods used in Machine Learning. We will review MapReduce techniques for parallel processing and Hadoop, an open source framework that allow us to cheaply and efficiently implement MapReduce on internet scale problems. We will spend considerable time mastering Spark, a memory based evolution of Hadoop. We will touch on related tools that provide SQL-like access to unstructured data like Hive. Students will gain the ability to design highly scalable systems that can accept, store, and analyze large volumes of unstructured data in batch mode and/or real time.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	By the end of the course the students will be able to do the following relative to a wide range of topics: 1. analyze and demonstrate the knowledge of the fundamental concepts of Big Data management and analytics; 2. create parallel algorithms that can process very large amounts of data; 3. analyze very large amounts of data; 4. analyze and store data in Hadoop; 5. deploy Hadoop; 6. administer Hadoop.

Description of discipline	
Code of discipline	NSP 7302
Name of discipline	Deep learning methods
Number of credits (ECTS)	3
Course, semester	1, 1
Department	Information Systems
Course author (s)	Pachshenko Galina Nikolayevna,Associate professor, Candidate of Technical Sciences.

Prerequisites	None
Postrequisites	preparation of PhD thesis
The aim of study of a discipline	The aim of the discipline is to master the principles of building neural networks by a doctoral candidate, gain knowledge about all types of neural networks and their skills in various tasks, gain knowledge in the field of modern models of artificial neural networks, and how to use them to solve practical problems.
Brief course description (main sections)	The course "Neural networks and their application in practical tasks" is a prospective discipline for the 1st-year doctoral students. During the study of this discipline, the principles of creating neural networks, types of neural networks and applications for various tasks are studied. As a result of the discipline, the doctoral student will receive knowledge in the field of modern models of artificial neural networks, learn the methods of using them to solve practical problems. The doctoral student will have to carry out innovative engineering projects for the development and software for various purposes using modern design methods, advanced experience in the development of competitive products. The doctoral student will be able to set tasks and develop algorithms for their solution for the implementation of software implementations of neural networks in order to solve practical different problems. In this discipline, a detailed review and description of the most important methods for neural networks training of different structures, as well as practical tasks, solved by these networks is given.
Expected Learning Outcomes (knowledge, abilities, skills and competencies acquired by students)	By the end of the course the doctoral students will be able to do the following relative to a wide range of topics: 1. To identify types of artificial neural networks 2. To compare and contrast the different ways for solving problems using neural networks 3. To analyze and solve practical tasks using neural networks and create program.