Faculty of Computer Technologies and Cybersecurity
Department of Computer Engineering

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Cyberphysical Systems

CATALOGUE OF ELECTIVE DISCIPLINES

2024 entry year

2024

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.

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of discipline	
Code of discipline	SFT6322
Name of discipline	Introduction of artificial intelligence
Number of credits (ECTS)	5
Course, semester	2, 3
Department	CE
Prerequisites	Programming in Python language
Postrequisites	Machine Learning - 1
Brief course description	The course will cover basic machine learning algorithms such as regression, classification, clustering, and neural networks, as well as deep learning and natural language processing technologies.
Expected learning outcomes	– Understanding the basics and history of artificial intelligence. – Knowledge of the principles of machine learning and neural networks. – Mastering the basic algorithms and models of AI. – Programming skills in languages used in AI (for example, Python). – Practical application of knowledge for the development and training of AI models. – Critical thinking and analysis of ethical and social aspects of AI application. – Communication and collaboration skills in interdisciplinary project teams and

Description of discipline	
Code of discipline	EGR6305
Name of discipline	3D modeling Altium Designer
Number of credits (ECTS)	5
Course, semester	2, 3
Department	CE
Prerequisites	Fundamentals of computer graphics
Postrequisites	3D printing Solidworks
Brief course description	Altium Designer 3D Modeling teaches you how to create three-dimensional models of electronic components and printed circuit boards in Altium Designer. Students learn how to create and edit 3D models, which helps in the visualization and design of electronic devices and their components.
Expected learning outcomes	Upon successful completion of the course, students will be able to: – Understanding the basics of 3D modeling and its application in Altium Designer. – Knowledge of the principles of creating and editing 3D models of electronic components. – Mastering the interface and tools of Altium Designer for 3D modeling.

Postrequisites	Fundamentals of information security
Brief course description	3D Printing Solidworks teaches students how to use the Solidworks software to create models and prepare them for 3D printing. The course covers the basic principles of modeling, the choice of materials and printing processes, as well as methods of quality management and economical use of resources.
Expected learning outcomes	– Knowledge of the principles of operation of 3D printers and various 3D printing technologies. – Skills of working in SolidWorks – Preparing models for 3D printing – Working with slicing software – Practical skills of working with a 3D printer – Development and implementation of your own 3D printing project from the idea to the finished product. – Familiarization with the latest trends and technologies in the field of 3D printing.

Description of discipline	
Code of discipline	MIN601
Name of discipline	Minor 1
Number of credits (ECTS)	5
Course, semester	2, 3
Department	
Prerequisites	
Postrequisites	
Brief course description	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students for study in order to form additional competencies
Expected learning outcomes	

Description of discipline	
Code of discipline	MIN602
Name of discipline	Minor 2
Number of credits (ECTS)	5
Course, semester	2, 4
Department	
Prerequisites	
Postrequisites	
Brief course description	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students

	– The ability to design simple electronic circuits and systems – The ability to analyze the operation of electronic systems and identify their main characteristics and parameters – Knowledge of the basics of microcontroller programming – Understanding the principles of integrating various electronic components into a single system – Knowledge of current trends and technologies in the field of electronic systems

Description of discipline	
Code of discipline	SFT6331
Name of discipline	Smart technologies
Number of credits (ECTS)	4
Course, semester	3, 6
Department	CE
Prerequisites	Machine Learning - 1
Postrequisites	Diploma project
Brief course description	The subject of the discipline is information technology infrastructure, the use of software, communication systems, networks and databases. The purpose of this course is to study rapidly developing and changing technologies in the field of embedded systems, sensors, and wireless networks.
Expected learning outcomes	– Understanding the basics of Smart technologies – Practical skills in using Smart technologies – Programming and integration skills – Data analysis and decision - making – Data security and protection – Understanding trends and the future of Smart technologies – Project activities

Description of discipline	
Code of discipline	SEC6301
Name of discipline	Fundamentals of information security
Number of credits (ECTS)	4
Course, semester	3, 6
Department	CE
Prerequisites	3D printing Solidworks
Postrequisites	Diploma project
Brief course description	It covers basic security concepts, principles and technologies, cryptography, attack methods and security monitoring. Studying basic security methods for searching for threats on the network using various popular security tools in a real network infrastructure.
Expected learning outcomes	– Understanding the basic concepts and terms of information security – Knowledge of legislative and regulatory aspects – Threat identification and analysis skills – Understanding the principles of risk management

	– Plan for the financial future, including pensions and savings.

Description of discipline	
Code of discipline	MGT6706
Name of discipline	Startups and entrepreneurship
Number of credits (ECTS)	5
Course, semester	3, 6
Department	Economics and Business
Prerequisites	
Postrequisites	Diploma project
Brief course description	This course provides an introduction to what a business is, how it works and how to run it. Students will define ownership and processes used in manufacturing and marketing, finance, personnel, and management in business operations.
Expected learning outcomes	After successful completion of the course, students will be able to: – Develop and evaluate a business idea, taking into account market trends and needs. – Create and submit a business plan that includes a financial, marketing and operational strategy. – Understand and apply startup financing methods, including venture financing and crowdfunding. – Assess and manage the risks associated with the launch and development of startups. – Apply business development and scaling strategies. – Work effectively in a team, taking on leadership roles and assigning tasks. – Understand the legal and regulatory aspects of entrepreneurship. – Use modern technologies and tools to manage a startup. – Develop presentation and communication skills to successfully present ideas and attract investors. – Evaluate the results of the startup's activities and make adjustments to the development strategy.

Description of discipline	
Code of discipline	JUR 6470
Name of discipline	Fundamentals of law and anti-corruption culture
Number of credits (ECTS)	5
Course, semester	3, 6
Department	Media communications and History of Kazakhstan
Prerequisites	
Postrequisites	Diploma project
Brief course description	The course outlines the legal, economic, and social foundations of fighting corruption. Throughout the course, students will gain practical knowledge in identifying the peculiarities of state policies, applying international experiences in combating corruption,

	resources and environmental pollution.
Expected learning outcomes	After successful completion of the course, students will be able to: – Understand the basic environmental processes and principles of sustainable development. – Analyze the impact of human activities on the environment. – Assess risks and develop strategies to reduce the negative impact on the environment. – To understand legislative acts and norms related to environmental protection and life safety. – Apply methods and tools to monitor and control the environmental situation. – Develop and implement measures to ensure environmental safety at work and at home. – Understand and apply the principles of rational environmental management and resource conservation. – Assess the state of ecosystems and develop plans for their restoration and protection. – Work with information and data on the state of the environment, analyze and interpret them. – To organize and carry out activities to improve the environmental culture and education of the population.

Description of discipline	
Code of discipline	RM6502
Name of discipline	Research metodology
Number of credits (ECTS)	5
Course, semester	3, 6
Department	Mathematical and Computer Modeling
Prerequisites	
Postrequisites	Diploma project
Brief course description	The course is devoted to the study of activities aimed at developing students " ability to independent theoretical and practical judgments and conclusions, skills of objective evaluation of scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for the diploma project (work).
Expected learning outcomes	After successful completion of the course, students will be able to: – Formulate research questions and hypotheses. – Conduct a literature review and critically analyze existing research. – Develop research designs, including the choice of data collection and analysis methods. – Apply qualitative and quantitative research methods. – Collect and interpret data using modern tools and software. – To design research papers and reports in accordance with academic standards. – To present the research results to a professional audience.