

Faculty of Information Technology

Department of Computer Engineering and Information Security



APPROVED BY

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6B06106

(Code of Educational Program)

Computer Systems and Software Engineering

(Name of Educational Program)

CATALOGUE OF ELECTIVE DISCIPLINES

2024 entry year

2024

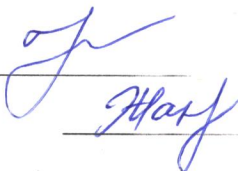
The catalogue of elective disciplines for the specialty/EP 6B06106 «Computer Systems and Software Engineering» is developed on the basis of the working curriculum of the specialty/EP.

The catalogue of elective disciplines was discussed at a meeting of the Computer Engineering and Information Security department

minutes No. _____ from “ _____ ” _____ 2024.

Head of Department

CED compiler



Chinibayeva T.T.

Bekaulova Zh.M.

The catalogue of elective disciplines was approved at a meeting of the Academic Council of JSC IITU

minutes No. _____ from “ _____ ” _____ 2024.

Head of the management of educational and methodological activities



Ajibayeva A.SH

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

№	Code of profile discipline (PD)	Name of discipline	Number of credits	Prerequisites
<i>5 semester</i>				
1	HRD6307	Microprocessor systems and complexes	5	Fundamentals of Logic Design
2	HRD6304	Sensor technologies	6	Object-Oriented Programming
3	MIN601	Minor 1	5	Introduction to data science
4	CUM 3255	Digital devices and micro processes	5	Fundamentals of Logic Design
5	HRD6308	Microcircuitry	5	Basic Circuit Theory
6	HRD6309	Microelectronics	5	Basic Circuit Theory
<i>6 semester</i>				
7	SFT6330	Circuit design language - Verilog	6	Object-Oriented Programming
8	MIN602	Minor 2	5	Minor 1
9	EEC6002	Design and simulation of electronic devices	5	Basic Circuit Theory
10	NET6304	Cloud computing and virtualization	5	Information and Communication Technology
11	RM6502	Research methodology	5	Culturology-Psychology
12	ECO6006	Economic theory	5	no
13	FIN6720	Basics of Financial Literacy	5	no
14	JUR 6470	Fundamentals of law and anti-corruption culture	5	Culturology-Psychology
15	MGT6706	Startups and entrepreneurship	5	no
16	JUR 6507	Fundamentals safety of life activity and ecology	5	Sociology-Political Science
<i>7 semester</i>				
17	SFT6315	DevOps	7	Application development foundation .NET
18	NET6308	Connecting Networks	7	Exploratory data analysis
19	MIN602	Minor 3	5	Minor 2

3 DESCRIPTION OF ELECTIVE DISCIPLINES

Description of discipline	
Code of discipline	HRD6307
Name of discipline	Microprocessor systems and complexes
Number of credits (ECTS)	5
Course, semester	3, 5
Department	CE
Prerequisites	Basic Circuit Theory
Postrequisites	Circuit design language – Verilog, Design and simulation of electronic devices
Brief course description	<p>The objectives of studying the discipline “Microprocessor systems and complexes” are:</p> <ul style="list-style-type: none"> studying the general principles of constructing microprocessor systems; mastering methods for developing and operating microprocessor systems from hardware and software points of view.

Description of discipline	
Code of discipline	CUM 3255
Name of discipline	Digital devices and micro processes
Number of credits (ECTS)	5
Course, semester	3,5
Department	CE
Prerequisites	Fundamentals of Logic Design
Postrequisites	Circuit Design Language – Verilog, Electronic Device Design and Simulation
Brief course description	<p>The purpose of this discipline is to form ideas:</p> <ul style="list-style-type: none"> - about the principles of construction, operation and use of digital devices <p>combinational and sequential types, as well as microprocessors in modern radio engineering devices, including computer equipment:</p> <ul style="list-style-type: none"> - about the operation of digital devices and microprocessors in electronic equipment. <p>Objectives of the discipline:</p> <ul style="list-style-type: none"> - study of processors flowing in typical units of digital devices; - studying the fundamentals of constructing electronic computing devices (ECD); - study of the arithmetic fundamentals of electronic computers; - study of the architectures of modern ECU microprocessors; - study of specific microprocessor components.

Description of discipline	
Code of discipline	MIN601
Name of discipline	Minor 1

Number of credits (ECTS)	5
Course, semester	3,5
Department	CE
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

Description of discipline	
Code of discipline	MIN602
Name of discipline	Minor 2
Number of credits (ECTS)	5
Course, semester	3,6
Department	CE
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

Description of discipline	
Code of discipline	NSA3 3308
Name of discipline	Design and simulation of electronic devices
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE
Prerequisites	Basic Circuit Theory
Postrequisites	Fundamentals of logic design
Brief course description	The study of semiconductor materials, their characteristics, principles of operation and application. The physics of semiconductors, diodes of p-n junctions, heterojunctions, transistors, metal-semiconductor contacts are considered.
Expected Learning Outcomes	After successful completion of the course students will be able to: <ul style="list-style-type: none"> – analyze semiconductor devices, through numerical problems, using fundamental characteristics of semiconductor materials, such as carrier densities, transport, lifetime, generation and recombination; – use basic governing equations to calculate carrier concentrations, position of Fermi energy level, carrier drift current in given field, built - in potential barrier at the space charge region, and current-voltage characteristics of p- n junctions; – analyze main characteristics of electronic and optoelectronic devices such as BJTs, MOSFETs and LEDs.

Description of discipline

Code of discipline	HRD6308
Name of discipline	Microcircuitry
Number of credits (ECTS)	5
Course, semester	3, 5
Department	CE
Prerequisites	Basic Circuit Theory
Postrequisites	Fundamentals of logic design
Brief course description	The goal of mastering the discipline "Microcircuitry" is the formation of a complex of professional knowledge and skills (possessions) in students and the assimilation of the physical principles of integrated microcircuits, their parameters, characteristics, their theoretical and experimental research and practical application in electronic products.

Description of discipline	
Code of discipline	HRD6309
Name of discipline	Microelectronics
Number of credits (ECTS)	5
Course, semester	3, 5
Department	CE
Prerequisites	Basic Circuit Theory
Postrequisites	Fundamentals of logic design
Brief course description	The purpose of the discipline "Mobile Technologies and Applications (Android)" is to teach students how to develop mobile applications for the Android platform. Upon completion of the course, students should be able to create functional and intuitive mobile applications using the Android toolkit.
Expected Learning Outcomes	After successful completion of the course students will: <ul style="list-style-type: none"> – Be exposed to technology and business trends impacting mobile applications; – Be competent with the characterization and architecture of mobile applications; – Be competent with understanding enterprise scale requirements of mobile applications; – Be competent with designing and developing mobile applications using one application development framework.

Description of discipline	
Code of discipline	SFT6330
Name of discipline	Circuit design language - Verilog
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE&IS
Prerequisites	Microprocessor systems and complexes
Postrequisites	Diploma project
Brief course description	Verilog HDL (Hardware Description Language) is a language for text description of hardware. It is used for design, simulation, verification of digital circuits

Description of discipline	
Code of discipline	HRD6304
Name of discipline	Sensor technologies
Number of credits (ECTS)	6
Course, semester	3, 6
Department	CE
Prerequisites	Introduction to Robotics
Postrequisites	Diploma project
Brief course description	Familiarity with the various types of sensors that are used for industrial automation, environmental assessment, as well as for human-computer interaction.
Expected Learning Outcomes	<p>After successful completion of the course students will be able to:</p> <ul style="list-style-type: none"> – develop judgment of what sensors and modalities are appropriate for different applications; – know how to electronically condition the sensor, hook it up to a microcomputer, and process the signal (at least basically); – have some idea of how/where these sensors can be used; – have a reasonable idea of how different sensors work; – develop a sense for recognizing bad data and an intuition of how to resolve problems.

Description of discipline	
Code of discipline	RM6502
Name of discipline	Research methodology
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE
Prerequisites	Culturology-Psychology
Postrequisites	no
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).

Description of discipline	
Code of discipline	ECO6006
Name of discipline	Economic theory
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE
Prerequisites	
Postrequisites	Culturology-Psychology

Brief course description	The course goal is to study and explain processes and the phenomena of economic life, and for this purpose it should get into an essence of deep processes, explain laws and predict ways of their use. attempts to provide comprehensive coverage of all the key elements in the discipline
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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	CE
Prerequisites	Sociology-Political Science
Postrequisites	
Brief course description	<p>Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat.</p> <p>Also the course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.</p>

Description of discipline	
Code of discipline	MGT6706
Name of discipline	Startups and entrepreneurship
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE
Prerequisites	Sociology-Political Science
Postrequisites	
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.

Description of discipline	
Code of discipline	JUR 6507
Name of discipline	Fundamentals safety of life activity and ecology
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE

Prerequisites	
Postrequisites	
Brief course description	<p>Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat.</p> <p>Also the course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.</p>

Description of discipline	
Code of discipline	FIN6720
Name of discipline	Basics of Financial Literacy
Number of credits (ECTS)	5
Course, semester	3, 6
Department	CE
Prerequisites	
Postrequisites	
Brief course description	<p>The course «Basics of Financial Literacy» is aimed at gaining knowledge and skills in the field of personal finance management. As part of the course, students will learn how to use all kinds of financial tools in practice, protect and increase savings, plan a budget competently, gain practical skills in calculating and paying taxes, and correctly filling out tax reports, learn how to analyze financial information and navigate financial products to choose an adequate investment strategy.</p>

Description of discipline	
Code of discipline	NET6304
Name of discipline	Cloud computing and virtualization
Number of credits (ECTS)	3
Course, semester	3, 6
Department	CE
Prerequisites	Information and Communication Technology
Postrequisites	Diploma project
Brief course description	<p>Introductory course from Linux Foundation experts. Learning the basics of cloud computing, terminology, tools and technologies associated with modern cloud platforms. The course displays the</p>

	entire cloudy landscape and explains how various tools and platforms interact with each other.
Expected Learning Outcomes	After successful completion of the course students will be able to: <ul style="list-style-type: none"> – configure and verify OpenStack Administration Utilities; – configure OpenStack Identity Service; – configure and troubleshoot OpenStack Nova component.

Description of discipline	
Code of discipline	MIN603
Name of discipline	Minor 3
Number of credits (ECTS)	5
Course, semester	4, 7
Department	CE
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

Description of discipline	
Code of discipline	SFT6315
Name of discipline	DevOps
Number of credits (ECTS)	7
Course, semester	4, 7
Department	CE
Prerequisites	OOP
Postrequisites	Diploma project
Brief course description	The course examines the key concepts and principles of DevOps, organizational factors and automation tools in the development of software products using this method.

Description of discipline	
Code of discipline	NET6308
Name of discipline	Connecting Networks
Number of credits (ECTS)	7
Course, semester	4, 7
Department	CE
Prerequisites	Network programming
Postrequisites	Diploma project
Brief course description	This course focuses on the LAN and WAN technologies and network services required in a complex network. Students will be able to integrate several LAN technologies and protocols from previous networking courses, implement WAN interconnection, provide security solutions for IP networks, manage networks in a unified manner.

