Syllabus
of the educational component ED

Computer-integrated management systems of industry facilities

Name of the discipline:	**Computer-integrated management systems of industry facilities**
Level of higher education:	**first (educational)**
Course homepage in Moodle:	***https://dl.khadi.kharkov.ua/course/view.php?id=1233***
Academic workload	**3 credits (90 hours)**
Form of summative assessment	**credit test**
Consultations:	**on schedule**
Name of the department:	**Department of automation and computer-integrated technologies**
Language of instruction:	**the english language**
Course leader:	**Fil Natalia Yurievna, PhD, Associate Professor**
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Summary of the educational component:

The aim is to familiarize students with the types of computer control systems of road industry facilities, their structures and functioning.
Subject: computer control systems of road industry enterprises.

The main tasks of studying the discipline are the formation of theoretical and practical skills in working with modern computer systems and the use of computer systems in the management of road industry enterprises.

Prerequisites for the study of the **educational component:** the study of the course involves systematic and thorough knowledge of the disciplines "Fundamentals of Information Technology", "Higher Mathematics", as well as purposeful work on the study of special literature active work at lectures, practical classes.

Competencies acquired by the applicant:

General competencies:

Ability to apply knowledge in practical situations.

Skills in the use of information and communication technologies.

Ability to search, process and analyze information from various sources.

Professional competencies:

Ability to use the latest technologies in the field of automation and computer-integrated technologies to solve professional problems, in particular, the design of multi-level control systems, data collection and archiving to form a database of process parameters and their visualization using human-machine interface tools.

Ability to freely use modern computer and information technologies to solve professional problems, program and use applied and specialized computer-integrated environments to solve automation problems.

Learning outcomes in accordance with the educational program:

Be able to apply modern information technologies and have the skills to develop algorithms and computer programs using high-level languages and object-oriented programming technologies, create databases and use Internet resources.

Be able to use a variety of specialized software to solve typical engineering problems in the field of automation, in particular, mathematical modeling, computer-aided design, database management, computer graphics methods.

Thematic plan

no. of topics	Name of topics (LC, PC, IW)	Number of hours		Literature
		face-to-face	correspondence	
1	2	3	4	5
1	LC1 Historical path of development of the CSU. Definition and classification of control systems	2	2	1.1-1.2
	PC1 Planning the working day of the head of the enterprise using Google applications.	2		
	IW1 Modern computer systems of road construction enterprise management	7	9	3.1
2	LC2. Modern approaches to the creation of computer control systems at enterprises	2		1.1-1.2
	PC2 Applied issues of probability theory in road construction design	2		
	IW2 Types of road construction company management systems	7	11	2.1
3	LC3 Standards of information computer systems of enterprises	2		1.1-1.2
	PC3 Use of extreme analysis models in road construction design	2		
	IW3 Task of extreme analysis.	7	11	2.1
4	LC4 Management decision support systems.	2		1.1-1.2
	PC4 Development of PPSS to determine the leader of the road construction company using MS Excel	2	1	

	IW4 Systematic approach to providing computer systems for enterprise management	7	11	2.1
5	LC5 Expert assessments in preparation of information for management decision making	2		1.1-1.2
	PC5 Formalization of decision making methods under uncertainty in MS Excel.	2		
	IW5 Methods of decision making under uncertainty	7	11	2.1
6	LC6 Information systems and technologies in forecasting enterprise development	2		1.1-1.2
	PC6 Application of MS Excel tools for enterprise knowledge base management	2		
	IW6 Information systems in the road sector: status and development trends	7	11	2.1
7	LC7 "IT enterprise" - enterprise management system	2		1.1-1.2
	PC7 Data analysis using MS Excel tools	2		
	IW7 Ways of digitalization of modern enterprise. Implementation of building information modeling	12	16	2.1,2.3, 2.4
8	LC8 Cybersecurity in computer systems of enterprise management	2		1.1-1.2
	PC8 Methods of decision making under uncertainty	2		
	IW8 LAW OF UKRAINE "On the Basic Principles of Cybersecurity of Ukraine". Protection of accounting information and cybersecurity at the enterprise	12	16	2.1, 2.5
LC		16	2	
PC		16		
IW		58	88	
ALL by discipline		90	90	

* LC – lecture classes, PC – practical classes, IW – individual work

Teaching methods:

MH1 - verbal method (lecture, educational discussion, explanation, story);

MH2 - practical method (practical classes, business and role-playing games, brainstorming);

MH3 - visual method (method of illustrations, method of demonstrations);

MH4 - work with literature (scientific literature; normative literature; search for information on the task);

MH6 - independent work;

Forms and methods of evaluation

FMO2 - summative assessment (credit test)

FMO3 - oral control (conversation)

FMO5 - test control

FMO7 - practical examination (defense of practical works,)

FMO8 - methods of self-control and summative assessment.

Evaluation system and requirements:

Current academic performance

1 The current performance of applicants for the performance of educational types of work in practical classes and for the performance of independent work tasks is evaluated using a four-point grading scale with the subsequent conversion to a 100-point scale. When assessing current progress, all types of work provided by the curriculum are taken into account.

1.1 Lecture classes are evaluated by determining the quality of specific tasks.

1.2 Practical classes are evaluated by the quality of the control or individual task, performance and design of practical work.

2 Evaluation of the current progress of applicants of the first (bachelor's) level is carried out at each practical lesson on a four-point scale ("5", "4", "3", "2") and recorded in the academic record.

- "excellent": the applicant has flawlessly mastered the theoretical material, demonstrates deep knowledge of the relevant topic or discipline, the main provisions;
- "good": the applicant has mastered the theoretical material well, knows the main aspects of the primary sources and recommended literature, reasonably presents it; has practical skills, expresses his thoughts on certain problems, but makes certain inaccuracies and errors in the logic of the presentation of theoretical content or in the analysis of practical content;
- "average" the applicant has basically mastered the theoretical knowledge of the subject or discipline, is oriented in the primary sources and recommended literature, but unconvincingly answers, confuses concepts, hesitates to answer additional questions, does not have stable knowledge; answering questions of a practical nature, shows inaccuracy in knowledge, is unable to evaluate facts and phenomena, to relate them to the future profession;
- "below average": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, is almost not oriented in primary sources and recommended literature, there is no scientific thinking, practical skills are not formed.

3 The final score for the current activity is recognized as the arithmetic mean of points for each class, for individual work, current control works according to the formula:

$$K^{curret} = \frac{K1 + K2 + .. Kn}{n}$$

,

where K^{curret} is the total formative score obtained based on the results of the formative assessment;

$K1, K2, ..., Kn$ is the score for the n^{th} formative assessment assignment;

n is the number of current control measures.

Grades are converted into scores according to the conversion scale (Table 1).

Table 1 - Conversion of the average grade for a formative assessment assignment into a multi-point scale

4-point scale	100-point scale	4-point scale	100-point scale	4-point scale	100-point scale	4-point scale	100-point scale
5	100	4,45	89	3,90	78	3,35	67
4,95	99	4,4	88	3,85	77	3,3	66
4,9	98	4,35	87	3,80	76	3,25	65
4,85	97	4,3	86	3,75	75	3,2	64
4,8	96	4,25	85	3,7	74	3,15	63
4,75	95	4,20	84	3,65	73	3,1	62
4,7	94	4,15	83	3,60	72	3,05	61
4,65	93	4,10	82	3,55	71	3	60
4,6	92	4,05	81	3,5	70	from 1.78 to 2.99	from 35 to 59
						retaking	
4,55	91	4,00	80	3,45	69	from 0 to 1.77	from 0 to 34
4,5	90	3,95	79	3,4	68	retaking	

Summative assessment

1 A higher education student receives a credit at the last class of the discipline based on the results of the current assessment. The average grade for the current activity is converted into points on a 100-point scale, according to the conversion table (Table 1).

Higher education applicants who have a current average grade in the discipline below "3" (60 points) in the last class can increase their current score by taking tests in the discipline.

Assessment of knowledge of applicants by testing is carried out on a scale:

- "Excellent": at least 90% of correct answers;
- "Very good": from 82% to 89% of correct answers;
- "Good": from 74% to 81% of correct answers;
- "Satisfactory": from 67% to 73% of correct answers;
- "Satisfactory enough": from 60% to 66% of correct answers;
- "Unsatisfactory": less than 60% of correct answers.

2 The condition for receiving credit is:

- working off all missed classes;
- the average current grade in the discipline is not lower than "3" (60 points).

3 Additional points are awarded for individual independent work and participation in scientific events.

3.1 Additional points are added to the sum of points gained by the applicant for higher education for the current educational activity (for disciplines, the final form of control for which is a test), or to the final grade in the discipline, the final form of control for which is an exam.

3.2 The number of additional points awarded for different types of individual tasks depends on their volume and significance:

- prizes in the discipline at the international / all-Ukrainian competition of scientific student works - 20 points;
- prize places in the discipline at the national competitions - 20 points;
- participation in the international / all-Ukrainian competition of scientific student works - 15 points

- participation in international/national scientific conferences of students and young scientists - 12 points;
- participation in national competitions in the discipline - 10 points
- participation in Olympiads and scientific conferences of KhNADU in the discipline - 5 points;
- performance of individual research (educational and research) tasks of increased complexity - 5 points.

3.3 The number of additional points cannot exceed 20 points.

4 The learning outcome is evaluated (select the appropriate one):

- on a two-point scale (passed/not passed) according to Table 2;
- on a 100-point scale (for differentiated scoring) according to Table 3.

The final score together with additional points cannot exceed 100 points.

Table 2 - Scale for assessing the knowledge of applicants based on the results of the final control of the discipline

Score	Assessment according to thenational scale		Assessment according to the ECTS Grading Scale	
	examination	offset	Grade	Criteria
90-100	**Excellent**	**Passed**	**A**	The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are formed, all course assignments are completed, the quality of most of them is estimated by the number of points close to maximum
80-89	**Good**	**Passed**	**B**	The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are mainly formed, all course assignments are completed, the quality of most of them is estimated by the number of points close to maximum
75-79			**C**	The theoretical content of the course is mastered completely, without gaps, some practical skills of working with the mastered material are insufficiently formed, all course assignments are completed, the quality of any of them is not assessed by the minimum number of points, some types of tasks are performed with errors

<table>
<tr><td rowspan="2">Score</td><td colspan="2" rowspan="2">Assessment according to thenational scale</td><td colspan="2">Assessment according to the ECTS Grading Scale</td></tr>
<tr><td>Grade</td><td>Criteria</td></tr>
<tr><td></td><td>examination</td><td>offset</td><td></td><td></td></tr>
<tr><td>67-74</td><td rowspan="2">Average</td><td rowspan="2"></td><td>D</td><td>The theoretical content of the course is partially mastered, but the gaps are not significant, the necessary practical skills of working with the mastered material are basically formed, most of the course assignments are completed, some of them contain errors</td></tr>
<tr><td>60-66</td><td>E</td><td>The theoretical content of the course is partially mastered, some practical skills are not formed, many of the course assignments are not completed, or the quality of some of them is estimated by the number of points close to minimum</td></tr>
<tr><td>35-59</td><td>Below average</td><td rowspan="2">Failed</td><td>FX</td><td>The theoretical content of the course is partially mastered, the necessary practical skills have not been formed, most of the learning tasks provided by the curriculum have not been completed, or the quality of their implementation is estimated by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of learning tasks (with the possibility of repeating)</td></tr>
<tr><td>0-34</td><td>Failing</td><td>F</td><td>The theoretical content of the course has not been mastered, the necessary practical skills have not been formed, all completed training tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of training tasks (with a mandatory repeated course)</td></tr>
</table>

Course policy:

- the course implies teamwork; the environment in the classroom is friendly, creative, open to constructive criticism;
- mastering the discipline involves mandatory attendance of lectures and practical classes, as well as individual work;
- individual work involves studying certain topics of the academic discipline that are assigned for individual study or considered briefly;
- all course assignment must be completed on time;

- if a higher education applicant does not attend classes for a valid reason, they present the completed assignments performed during their individual work at the consultation with the teacher;

- while studying the course, higher education applicants must adhere to the rules of academic integrity set out in the following documents: “Rules of academic integrity for participants in the educational process at KhNADU” (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_dobroch_1.pdf), “Academic integrity. Checking the text of academic, scientific andqualification works for plagiarism” (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_85_1_01.pdf, “Code of ethics for participants in the educational process at KNADU” (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).

Recommended literature:

1. Basic

1.1 Information systems and technologies in road transport: textbook / V. Kashkanov, A. Kashkanov, V. Kuzhel - Vinnytsia: VNTU, 2020. - 104 c.

1.2 Fil N.Y. Binkovska A.B. Methodical instructions for conducting practical work in the discipline "Computer control systems" for students in the direction of training 151 Automation and computer-integrated technologies: KhNADU, 2022. 44 p.

2. Supplementary and iformation resources:

1. Computer control systems [Electronic resource]. Access mode: https://dl.khadi.kharkov.ua/course/view.php?id=2241.

2. NTB KhNADU (Kharkiv, 25 Yaroslav Mudryi St.) - Electronic resource -. Access mode: http://library.khadi.kharkov.ua/

3. Guide to the implementation of information modeling in construction, created by the European public sector. Access mode http://www.eubim.eu/wp-content/uploads/2020/12/2017_EU-BIM-Handbook_ua.pdf

4. Kovalchyk O., Dmytriv D. Information systems in the road industry: state and trends of development // Galician Economic Herald. - 2012. - No2(35). - c.52-61.

5. Kunchenko-Kharchenko V., Ogirko I., Kostelnyuk D. Information technologies of forecasting and modeling of cybersecurity -Electronic resource-. Access mode: https://cutt.ly/F27sqHx.

6. Fil N.Y. Structural model of supplier selection in the management of emergency prevention projects on main roads // Instrumentation technology. - 2015. - C. 62-65.

7. Fil N. Yu. Functional model of winter road maintenance projects management // Telecommunications and Information Technologies, 2016. - №2 - P. 26-34.

8. Fil' N. Functional model of information technology management of natural emergency situations on the main highways // Automation of technological and business processes, 2016. Vol. 9, No. 2. - P. 57-61.

9. Fil N.Y. Mathematical model of the choice of elements of the weather monitoring system for main roads // Technological audit and production reserves.- 2016. -№3/2(23) - C. 57-61.

10. Fil N.Y. Functional model of information technology of the system of professional development at the machine-building enterprise / N.Y. Fil, D.S. Novichkov. - "Project management and production development." - 2016. - №4(60). - C. 46-52.

11. Nefyodov L.I. Model of an expert system and assessment of the quality level of preparation of metal products for electroplating based on fuzzy logic // Instrumentation technology. - 2019. -№1. - C.8-12.

12. Fil, N. Y. Model of selection of mini-excavator for road construction works by many criteria / Fil N. Y., Ilge I. G. // Bulletin of Kharkiv National Automobile and Road University :

a collection of scientific articles / Ministry of Education and Science of Ukraine, KhNADU ; edited by A. G. Batrakova (chief editor) and others - Kharkiv, 2021 - Issue 92, vol. 1 - P. 114-118. DOI: 10.30977/BUL.2219-5548.2021.92.1.114.

13. Fil N.Y., Kudyrko O.M. Fuzzy model of work distribution between employees in the warehouse of the enterprise. Computer-integrated technologies: education, science, production. 2021. №44 66-75. https://doi.org/10.36910/6775-2524-0560-2021-44-11.

14. Fil N. Y. Models of equipment selection for car service // Scientific journal "Computer-integrated technologies: education, science, production", Lutsk, 2022. № 47, C. 49-55.

Developer:

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