# Syllabus selective component

## Computer-integrated technologies of business process management

Subjects:	Computer-integrated technologies of business process management
Level of higher education:	First (undergraduate)
Course page in Moodle:	https://dl2022.khadi-kh.com/course/view.php?id=4023
The scope of the educational component	3 credits (90 hours)
Final control form	test
Consultations:	on schedule
Name of the department:	Department of Automation and Computer-Integrated Technologies
Teaching language:	Ukrainian
Course leader:	Ihor Henrikhovich Ilhe, Ph.D., associate professor
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## Brief content of the educational component:

The purpose of studying the educational component is the formation of students' system of theoretical and practical knowledge in the field of business process management based on modern computer-integrated technologies.

**Subject:** a pedagogically adapted system of concepts about the principles and means of organizing computer-integrated management of business processes.

## The main tasks of studying an academic discipline are:

- study of the basic principles of computer-integrated control, types of architecture of computer-integrated control systems and organization of data transfer;

- acquisition of modeling skills of computer and industrial networks in computer-integrated business process management systems;

- formation of skills of justified choice of structure, algorithms and business process management schemes in computer-integrated environments;

- mastering the basic techniques of applying application program packages for modeling computer-integrated business process management systems.

## Prerequisites for studying the educational component:

Computer-integrated management systems of industry objects, Flexible automated production and robotic complexes; System analysis; Identification and modeling of automation objects.

## Competencies acquired by the acquirer:

#### General competences:

Ability to apply knowledge in practical situations. Ability to communicate in the national language both orally and in writing. Skills in using information and communication technologies. Ability to search, process and analyze information from various sources.

#### Special (professional) competences:

The ability to apply knowledge of physics, electrical engineering, electronics and microprocessor technology to the extent necessary for understanding processes in automation systems and computer-integrated technologies.

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

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

#### Learning outcomes according to 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.

To understand the essence of the processes that take place in automation objects in the fields of instrument construction and automation of construction, road machinery and equipment, and to be able to analyze automation objects and justify the choice of their structure, algorithms and control schemes based on the results of the study of their properties.

Be able to apply the methods of system analysis, modeling, identification and numerical methods to develop mathematical and simulation models of individual elements and automation systems as a whole, to analyze the quality of their functioning using the latest computer technologies.

Be able to design multi-level control and data collection systems to form a database of process parameters and their visualization using human-machine interface tools, using the latest computer-integrated technologies.

Be able to use a variety of specialized software for solving typical engineering tasks in the field of automation, in particular, mathematical modeling, automated design, database management, computer graphics methods.

To be able to increase the degree of automation and robotization of construction, road machines and equipment, taking into account the world-level scientific and engineering achievements in the field of development and operation of automated machine-building systems, including the Internet of Things technologies, and Industry 4.0.

# Thematic plan

Topic No	Name of topics (Lectures (LC), laboratory work (LW), practical works (PW), independent work (IW)	Number of hours		
		ocular	extram	
			ural	
1	2	3	4	
	LC Basic principles of computer-integrated management. Structural			
	diagram and levels of organization of computer-integrated production.	2		
1	CALS - technologies			
	LW Introducing the RATIONAL ROSE tool into CASE.	4		
	IW Concept of Rational Unified Process	6		
	LC . Functions and modes of operation of the Computer control			
	systems. Composition of functional modules of Computer control	4		
2	systems. Modeling functions in CASE tools.			
2	LW Creating a use case model	4		
	IW Collection and primary processing of information in Computer	6		
	control systems	0		
	LC The structure of hierarchically-distributed automated control			
	systems. Concepts of software and hardware solutions. The client-	2		
3	server model.			
	LW Architectural analysis of the system.	6		
	IW : Protocols of networks of the lower level of ACSTP	7		
	LC Networks and nodes of the upper and lower levels of ACS.	4		
4	LW Interaction diagrams.	6		
	IW . Operating systems of workstations and computer networks	7		
	LC Computer-integrated management of organizational and economic			
	processes. The structure of ACS by organizational and economic			
5	processes.			
	LW Construction of a class diagram with analysis operations	6	-	
	IW Optimal management of business processes.	8		
	LC Integration of ACS. Software integration tools.	2		
6	LW System architecture design	6		
	IW Automation of system code generation	8		
	LC	16		
Разом	LW	32		
	IW	42		

# Individual educational and research task (if available):

# Teaching methods:

1) verbal: 1.1 traditional: lectures, explanations, stories, etc.;

1.2 interactive (non-traditional): problem lectures, discussions, etc.;

2) visual: method of illustrations, method of demonstrations

3) practical: 3.1 traditional: practical classes, seminars;

3.2 interactive (non-traditional): business and role-playing games, trainings, seminarsdiscussions, "round table", brainstorming method.

## Evaluation system and requirements:

# Current performance

1 The current success of applicants for the performance of educational types of work in training sessions and for the performance of independent work tasks is evaluated using a four-point rating scale with subsequent transfer to a 100-point scale. During the evaluation of the current academic performance, all types of work provided by the educational program are taken into account.

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

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

1.3 Laboratory classes are evaluated by the quality of reports on the performance of laboratory work.

1.4 Seminar classes are evaluated by the quality of individual assignment/abstract.

2 The current performance of higher education applicants is assessed at each practical session (laboratory or seminar) on a four-point scale ("5", "4", "Z", "2") and entered in the journal of academic performance.

- "excellent": the winner mastered the theoretical material flawlessly, demonstrates deep knowledge of the relevant topic or academic discipline, the main provisions;

- "good": the applicant has mastered the theoretical material well, has the main aspects from primary sources and recommended literature, presents it in a reasoned way; has practical skills, expresses his thoughts on certain problems, but certain inaccuracies and errors are assumed in the logic of the presentation of theoretical content or in the analysis of practical ones;

- "satisfactory": the applicant has basically mastered the theoretical knowledge of the educational topic or discipline, orients himself in primary sources and recommended literature, but answers unconvincingly, confuses concepts, answers additional questions uncertainly, does not have stable knowledge; when answering questions of a practical nature, reveals inaccuracy in knowledge, does not know how to evaluate facts and phenomena, connect them with the future profession;

- "unsatisfactory": the applicant has not mastered the educational material of the topic (discipline), does not know scientific facts, definitions, hardly orients himself in primary sources and recommended literature, lacks scientific thinking, practical skills are not formed.

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

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

де  $K^{n}$  – final assessment of success based on the results of current control;

 $K1, K2, \dots, Kn$  – evaluation of the success of the current control measure;

n – number of ongoing control measures.

Assessments are converted into points according to the calculation scale (table 1).

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
						reassem	bly
4,55	91	4,00	80	3,45	69	from 0 до 1,77	from 0 to 34
4,5	90	3,95	79	3,4	68	repeated study	

Table 1 - Recalculation of the average grade for the current activity into a multi-point scale

## **Final assessment**

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

Applicants for higher education who have a current grade point average in the discipline lower than "3" (60 points) can increase their current grade by taking tests in the discipline in the last session.

Assessment of the knowledge of applicants through testing is carried out according to the following 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 obtaining credit is:

- making up for all missed classes;

- the average current grade in the discipline is not lower than "3" (60 points).

3 For performing individual independent work and participation in scientific events, additional points are awarded to the winners.

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

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

- prizes in the discipline at the international / all-Ukrainian competition of scientific student works - 20 points;

- prize places in the discipline at the All-Ukrainian Olympiads - 20 points;

- participation in the international / all-Ukrainian competition of scientific student works - 15 points

- participation in international / all-Ukrainian scientific conferences of students and young scientists - 12 points;

- participation in all-Ukrainian Olympiads in the discipline - 10 points

- participation in Olympiads and scientific conferences of the Khnadu in the discipline - 5 points;

- performance of individual scientific and research (educational and research) tasks of increased complexity - 5 points.

3.3 The number of additional points cannot exceed 20 points.

4 The learning result is evaluated (select is required):

- on a two-point scale (passed/failed) according to table 2;

- on a 100-point scale (for differentiated assessment) according to table 3.

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

**Table 2 –** Scale for transferring points to the national evaluation system

On a 100-point scale	On a national scale
from 60 points to 100 points	counted
less than 60 points	not counted

**Table 3 –** The scale for evaluating the knowledge of students based on the results of the final control of the academic discipline

Score	Evaluation	n on a	Evaluation according to the ECTS scale		
in points	national scale		Rating	Criteria	
penne	examination	test			
90- 100	Perfectly	Enrolled	A	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical skills for working with the mastered material have been formed, all educational tasks provided for in the training program have been completed, the quality of their performance has been assessed with a number of points close to the maximum	
80–89	Okay	Enrolled	В	The theoretical content of the course has been mastered in its entirety, without gaps, the necessary practical skills for working with the mastered material have mainly been formed, all educational tasks provided for by the training program have been completed, the quality of most of them has been assessed with a number of points close to the maximum	

Score	Evaluation on a		Evaluation according to the ECTS scale		
IN pointe	national scale		Rating Criteria		
points	examination	test			
75-79			С	The theoretical content of the course has been mastered in its entirety, without gaps, some practical skills of working with the mastered material have not been formed enough, all educational tasks provided for by the training program have been completed, the quality of none of them has been assessed with a minimum number of points, some types of tasks have been completed with errors	
67-74	ctorily		D	The theoretical content of the course is partially mastered, but the gaps are not of a significant nature, the necessary practical skills for working with the mastered material are basically formed, most of the educational tasks provided by the training program have been completed, some of the completed tasks may contain errors	
60–66	Satisfa		E	The theoretical content of the course has been partially mastered, some practical work skills have not been formed, many of the educational tasks provided by the training program have not been completed, or the quality of some of them has been assessed with a number of points close to the minimum.	
35–59	Unsatisfactorily	Not counted	FX	The theoretical content of the course has been partially mastered, the necessary practical work skills have not been formed, most of the prescribed training programs of educational tasks have not been completed, or the quality of their implementation has been assessed with a number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of the performance of educational tasks (with the possibility of retaking)	

Score	Evaluation on a national scale		Evaluation according to the ECTS scale		
in points			Rating Criteria		
-	examination	test			
0–34	Unacceptable		F	The theoretical content of the course has not been mastered, the necessary practical work skills have not been formed, all completed educational tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the performance of educational tasks (with a mandatory repeat course).	

# **Course policy:**

- the course involves working in a team, 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 independent work;

- independent work involves the study of individual topics of the academic discipline, which are presented in accordance with the program for independent study, or were considered briefly;

- all tasks provided by the program must be completed within the set time;

- if the student of higher education is absent from classes for a good reason, he presents the completed tasks during independent preparation and consultation of the teacher;

- the coursework must be protected no later than a week before the beginning of the examination session (**indicated if available**);

- while studying the course, students of higher education must adhere to the rules of academic integrity set forth in the following documents: "Rules of academic integrity of participants in the educational process of the KHNADU" (https://www.khadi.kharkov.ua/fileadmin/P\_Standart/pologeniya/stvnz\_67\_01\_dobroch\_1.p df), "Academic integrity. Checking the text of academic, scientific and qualification works for

(<u>https://www.khadi.kharkov.ua/fileadmin/P\_Standart/pologeniya/stvnz\_85\_1\_01.pdf</u>), "Moral and ethical code of participants in the educational process of the KHNADU (https://www.khadi.kharkov.ua/fileadmin/P\_Standart/pologeniya/stvnz\_67\_01\_MEK\_1.pdf).

- in case of detection of plagiarism, the applicant receives 0 points for the task and must repeat the tasks provided for in the syllabus;

- writing off during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during online testing.

**Recommended Literature:** (Literature not later than 10 years except 1 fundamental classic textbook or monograph)

1. Ilge I.G. Development of corporate information systems: study guide / L.P. Shevchenko, L.A. Hnuchykh. - Kharkiv: KhDTUBA, 2002. - 112 p.

2. Nazarov S.V. Architecture and design of software systems: monograph / S.V. Nazarov. - M.: Infra-M, 2016. – 374 p.

3. Scott K. UML Basic Concepts / K. Scott. - M.: Williams, 2017. – 144 p.

4. Tregub V.G. Design of automation systems: Education. manual. - K.: Lira-K Publishing House, 2017. - 344 p.

5. Pushkar, M.S. Design of automation systems [Text]: teaching. manual / M.S. Pushkar, S.M. Protsenko - D.: National Mining University, 2013. - 268 p. (Access mode: http://ir.nmu.org.ua/bitstream/handle/123456789/3536/

CD218.pdf?sequence=1&isAllowed=y)

6. Methodical instructions for the course work on the discipline "Fundamentals of computer-integrated management" / KHNADU author. I.H. Ilge: - Kh., 2018. - 28 p.

## Додаткові джерела:

- 1. дистанційний курс: <u>https://dl2022.khadi-kh.com/course/view.php?id=4023</u>
- Design of automation systems [Electronic resource]: training. manual for students Specialties 151 "Automation and computer-integrated technologies", educational and professional program "Automation and computer-integrated technologies of cyber-energy systems" / Composers: T. H. Bagan, O. V. Nekrashevich; KPI named after Ihor Sikorskyi. – Electronic text data (1 file: 2.89 MB). - Kyiv: Ihor Sikorskyi KPI, 2020. - 59 p. . (Access mode https://ela.kpi.ua/bitstream/123456789/42676/1/PSA RPD.pdf)
- Educational manual "Automated production equipment" "Modern trends in the development of automation systems" for in-depth study of the discipline. [Electronic resource]: education. manual for students specialty 131 "Applied mechanics", specialization "Technologies of computer design of machines, robots and machines"; KPI named after Igor Sikorsky. – Electronic text data (1 file: 5.65 Mbytes). -Kyiv: KPlim. Igor Sikorskyi, 2020. – 260 p. . (Access mode https://ela.kpi.ua/bitstream/123456789/31516/1/Oblad\_avt\_vyrob\_TENDENTSII.p df)
- Modeling of control systems in SIMULINK: учеб. allowance / [V. A. Bogomolov, A. G. Gurko, V. I. Klymenko, D. N. Leontiev, A. N. Krasiuk]; Ministry of Education and Science of Ukraine, Khnadu. - Kharkiv: Khnadu, 2018. - 220 p. - ISBN 978-966-303-693-9 (Access mode:

https://dspace.khadi.kharkov.ua/dspace/handle/123456789/2533)

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