Silabus educational component of the EC

(conventional designation OK in the educational program (EP))

randamentals of CALS technologies					
Fundamentals of CALS technologies					
first (educational and scientific)					
https://dl.khadi.kharkov.ua/course/view.php?id=2328					
3 credits (90 hours)					
Credit					
on schedule					
Department of automation and computer-integrated					
technologies					
Ukrainian					
Kononykhin Oleksandr S., Associate Professor,					
Candidate of Technical Sciences					
0996637295					
Alex.kon.akit@gmail.com					

Fundamentals of CALS technologies

Summary of the educational component:

The aim is to form a system of knowledge of higher education students about the tasks, principles and methods and CALS-technologies

Subject: theoretical and methodological foundations, methodological provisions of scientific directions of CALS-technologies

The main tasks of studying the discipline are:

- mastery of methods of measurement evaluation, processing and analysis, using the apparatus of computational mathematics.

- mastery of the basic methods of analyzing and identifying risks, threats and hazards in the workplace and apply them in the development;

- understanding of scientific and mathematical principles necessary for solving engineering problems in the field of automation and computer-integrated technologies.

Competencies acquired by the applicant:

General competencies:

Ability to apply knowledge in practical situations.

Ability to communicate in the state language both orally and in writing.

Skills in the use of information and communication technologies.

Special (professional) competencies:

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

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:

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

Be able to apply 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 technology.

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.

Learning outcomes in accordance with the educational program:

To create highly reliable automation systems with a high level of functional and information security of software and hardware.

Apply specialized conceptual knowledge, including modern scientific achievements, as well as critical understanding of modern problems in the field of automation and computer-integrated technologies to solve complex problems of professional activity.

To develop computer-integrated control systems for complex technological and organizational and technical objects, using a systematic approach, taking into account non-technical components of the assessment of automation objects.

Develop functional, organizational, technical and information structures of automation systems for complex technological and organizational and technical objects, develop software and hardware control systems with the use of network and information technologies, industrial controllers, mechatronic components, robotic devices, humanmachine interface tools and taking into account technological conditions and requirements for production management.

Adhere to the norms of academic integrity, know the basic legal norms on the protection of intellectual property, commercialization of the results of research, inventive and project activities.

Collect the necessary information using scientific and technical literature, databases and other sources, analyze and evaluate it.

no. of topics		Number of hours					
	Name of the topic (LC, PL, IL)	face- to-face	corres ponde nce				
	LC Information systems at the enterprise	2					
1	PL Traffic operators	2					
	IL Structure of the enterprise information system Stages of information systems development	10	20				
	LC Automated control systems at the enterprise						
2	PL Postprocessor operators	4					
2	IL Provision of information systems Hierarchy of automated systems	10	20				
3	LC Software CALS-technologies	2					
	PL G-code	2					
	IL Software product PDM STEP Suite Software products of SAP company	10	20				

Thematic plan

4	LC Information security in CALS-systems	4	
	PL Development of the milling machine program	4	
	IL Technologies for building a secure network	15	10
	LC . Issues of implementation of CALS-technologies	2	
5	PL Development of welding machine program	2	
	IL Prerequisites for implementation of CALS-technologies Basic principles of CALS implementation Features of implementation	9	10
	LC Direction of development of modern information technologies of production management	2	
6	PL Modern software of CNC machines	2	
	IL Practical implementation of new technologies.	9	10
Toget her	LC	16	
	PL	16	
	IL	58	90

Individual educational and research task (if available):

Teaching methods:

- verbal method (lecture, educational discussion, explanation, story);
- practical method (practical classes, business and role-playing games, brainstorming);
- visual method (method of illustrations, method of demonstrations);

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

- independent work;
- Forms and methods of evaluation
- final control (offset)
- oral control (conversation)
- test control
- practical examination (protection of practical works,)
- methods of self-control and self-assessment

Evaluation system and requirements:

Current academic performance

1 The current performance of applicants for the performance of educational activities in the classroom and for the performance of independent work is assessed 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.

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

1.4 Seminar classes are evaluated by the quality of individual assignments / essays.

2 Evaluation of the current progress of higher education students is carried out at each practical lesson (laboratory or seminar) on a four-point scale ("5", "4", "C", "2") and recorded in the academic record book.

- "excellent": the applicant has perfectly mastered the theoretical material, demonstrates in-depth 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, argumentatively 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;

- "satisfactory": 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;

- "unsatisfactory": 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:

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

where K^{nomov} is the final assessment of success based on the results of the current control;

 $K1, K2, \dots, Kn$ - assessment of the success of the *n* current control measure;

n - number of current control measures.

Scores are converted into points according to the conversion scale (Table 1).

 Table 1 - Conversion of the average score for the current activity 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
						reassen	nbly
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	re-examination	

Final evaluation

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 current educational activities (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 required):

- 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 of points conversion to the national evaluation system

On a 100-point scale	On a national scale
from 60 points to 100 points	enrolled
less than 60 points	unaccounted for

 Table 3 - Scale for assessing the knowledge of students based on the results of the final control of the discipline

Score	Assessment on		Evaluation on the ECTS scale		
IN points	the national scale		Evaluat	Criteria.	
pointe	examina tion	offset	ion		
90-100	That' s great.	Enro lled	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 the training tasks provided by the training program are completed, the quality of their implementation is estimated by the number of points close to the maximum	
80-89	Olean			The theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the mastered material are basically formed, all the training tasks provided by the training program are completed, the quality of most of them is estimated by the number of points close to the maximum	
75-79	75-79 Okay. Enro Iled	С	The theoretical content of the course is fully mastered, without gaps, some practical skills of working with the mastered material are insufficiently formed, all the training tasks provided by the curriculum 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		
67-74	Satisf	Satisf		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 training tasks provided by the curriculum are completed, some of the completed tasks may contain errors	
60-66	у		E	The theoretical content of the course has been mastered partially, some practical skills have not been formed, many of the training tasks provided by the training program have not been completed, or the quality of some of them is estimated by the number of points close to the minimum.	

Score	Assessment on		Evaluation on the ECTS scale		
points	the nation	nal scale	Evaluat	Criteria.	
	examina offset tion				
35-59	Unsat isfact ory	Not enrol	FX	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)	
0-34	Unac cepta ble.		F	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)	

Policy of the course:

- the course involves 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 independent work;

 independent work involves the study of individual topics of the discipline, which are submitted in accordance with the program for independent study, or were considered briefly;
 all tasks provided by the program must be completed in due time;

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

- the term paper must be defended no later than one week before the start of the examination session *(indicated if available)*;

- while studying the course, higher education students must adhere to the rules of academic integrity set out in the following documents: "Rules of academic integrity of participants of the educational process of KNADU" (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 papers for

(https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_85_1_01.pdf), "Moral and ethical code of participants of the educational process of KNADU (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_67_01_MEK_1.pdf).

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

- cheating during tests and exams is prohibited (including using mobile devices). Mobile devices are allowed to be used only during on-line testing.

Recommended reading: (*literature not older than 10 years, except for 1 fundamental classic textbook or monograph*)

11. O.M. Pupena, I.V. Elperin, N.M. Lutska, A.P. Ladanyuk. Industrial networks and integration technologies in automated systems: Textbook - K.: Lira-K Publishing House, 2013.- 552 p.

2. Stenzel Y.I. Mathematical modeling of technological objects of management: Study guide - K.: ISDO.2013.-320p.

3. IEEE Std 802.11b-1999, Supplement to IEEE Standard for Information technology-Telecommunications and information exchange between systems-Local and metropolitan area networks- Specific requirements.

4.IEEE Std 802.11g-2004, IEEE Standard for Information technology- Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements- Specifications.

5.IEEE Std 802.11i-2004, IEEE Standard for Information technology- Telecommunications and information exchange between systems-Local and metropolitan area networks-Specific requirements.

6.IEEE Std 802.11n-2009, IEEE Standard for Information technology- Telecommunications and information exchange between systems-Local and metropolitan area networks.

7.IEEE 802.15.4. Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (LRWPANs), 2003

8. Palmer M., Sinclair R. B. Design and implementation of computer networks. Training course, 2007 - 164c

9. 4. Nefyodov L.I., Zgonnyk O.E. Model for choosing a server for a satellite monitoring system for construction and road equipment / Bulletin of Kharkiv National Automobile and Road University : collection of scientific works - 2021. - Issue 92, Vol. 1. - P. 92-Additional **sources:**

1. distance course: https://dl.khadi.kharkov.ua/course/view.php?id=232

Developer(s)

educational course syllabus

O. Kononykhin

Department Chair

_____ O. Hurko