Syllabus
selective component of VC

Methods of testing and evaluating software quality

Name of discipline:	Methods of testing and evaluating software quality
Course page in Moodle:	https://dl2022.khadi-kh.com/course/view.php?id=2339
The amount of the educational component is	**4 credits (120 hours)**
Form of final control	**tests**
Consultations:	**according to the schedule**
Name of the department:	**Department of Computer Technologies and Mechatronics**
Teaching language:	**English**
Head of the course:	**Olena Pavlivna Shaposhnikova, candidate of technical sciences, associate professor of the KTM department**
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Brief content of the educational component:
The goal is theoretical and practical training of students, which should prepare a specialist who has basic knowledge of the main types and methods of software (software) testing with a structural and object-oriented approach in programming, knows ways to ensure the quality of software, classes of testing criteria, types of testing
Subject: theoretical and methodological foundations, methodological provisions of scientific areas, methods of testing and evaluating the quality of software.
The main tasks of studying the academic discipline are formation of a set of knowledge about methods of manual software testing, features of system, module and integration testing, models for evaluating the degree of software product testing, and the ability to assess the complexity of a software product using a mathematical model, use methods of manual and automated software testing, create a set of tests for testing simple and complex systems.
Prerequisites for studying the educational component:
Fundamentals of information technology, Algorithmization and programming, Object-oriented programming, Architecture and analysis of software requirements, Web programming

Competencies acquired by the acquirer:
General competences:
- Ability to abstract thinking, analysis and synthesis.
- Ability to search, process and analyze information from various sources.

Special (professional) competences:
- ability to identify, classify and formulate software requirements;
- the ability to formulate and ensure software quality requirements in accordance with customer requirements, specifications and standards;

Learning outcomes according to the educational program:

- to analyze, purposefully search for and choose information and reference resources and knowledge necessary for solving professional tasks, taking into account modern achievements of science and technology;
- know the code of professional ethics, understand the social significance and cultural aspects of software engineering and adhere to them in professional activities;
- know and apply professional standards and other legal documents in the field of software engineering;
- know and be able to apply software verification and validation methods;
- know approaches to software quality assessment and assurance.

Thematic plan

№ Topic	Title of topics (LC, LR, PR, SZ, SR)	Number of hours	
		intra mural	extramural
1	LC Fundamentals of software quality assessment. Basic concepts of software testing.	2	
	PR (LR, SZ) Types of testing. Testing planning	4	
	SR Processing of lecture materials and laboratory work.	9	
2	LC Processes of software testing and development.	2	
	PR (LR, SZ) Development of requirements	4	
	SR Processing of lecture materials and laboratory work.	9	
3	LC. Types and areas of testing	2	
	PR (LR, SZ) Requirements testing.	4	
	SR Processing of lecture materials and laboratory work.	9	
4	LC Development of test cases using checklists.	2	
	PR (LR, SZ) Software testing: development	4	
	SR Processing of lecture materials and laboratory work.	9	
5	LC Defect reports.	2	
	PR (LR, SZ) Finding and documenting defects	4	
	SR Processing of lecture materials and laboratory work.	9	
6	LC Assessment of labor costs. Planning and reporting	2	
	PR (LR, SZ) Documentation of test results	4	
	SR Processing of lecture materials and laboratory work.	9	
7	LC Testing Techniques	2	
	PR (LR, SZ) Usability testing: an expert approach.	4	
	SR Processing of lecture materials and laboratory work.	9	
8	LC Testing Techniques	2	
	PR (LR, SZ) Usability testing.	4	
	SR Processing of lecture materials and laboratory work.	9	
Total	LC	16	
	PR (LR, SZ)	32	
	SR	72	

Individual educational and research task:
Detailed examination by students of individual theoretical provisions of the academic discipline and the formation of skills and abilities in their practical application by performing the assigned tasks.

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): trainings, “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 manner; 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; 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:

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

where $K^{current}$ is the final assessment of success based on the results of current control;
K1, K 2,...,Kn – evaluation of the success of the nth measure of current control;
n is the number of measures of current control.
Assessments are converted into points according to the calculation scale (table 1).

Table 1 – Recalculation of the average grade 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
						retaking the test	
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	repeated study	

Final assessment

1 The exam is held after studying all topics of the discipline and is completed by students of higher education during the examination session after the end of all classroom occupation.

2 Students of higher education who have completed all types of work prescribed by the curriculum in the discipline are admitted to the exam:

- were present at all classroom classes (lectures, seminars, practical);
- completed all missed classes on time;
- scored the minimum number of points for the current academic performance (at least 36 points, corresponding to the national scale "3");

If the current success in the discipline is lower than 36 points, the higher education applicant has the opportunity to increase his current point to the minimum before the beginning of the examination session.

3 Assessment of the knowledge of applicants when taking the exam is carried out on a 100-point scale.

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.

4 The final grade for the academic discipline is defined as a weighted average grade that takes into account the overall grade for the current academic performance and the grade for passing the exam.

5 The calculation of the overall final grade for the study of an academic discipline is carried out according to the formula:

$$ПК^{exa} = 0,6 \cdot K^{current} + 0,4 \cdot E$$

where $ПК^{exa}$ exam is the final assessment of success in the disciplines, in the form of the final controls for which there is an exam;

$K^{current}$ – final assessment of success based on the results of current control (on a 100-point scale);

E - grade based on the results of the exam (on a 100-point scale).

0.6 and 0.4 – coefficients of the ratio of points for current success and passing the exam.

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

6.1 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 test), or to the final grade for a discipline for which the final form of control is an exam.

6.2 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.

6.3 The number of additional points cannot exceed 20 points.

7 The total final grade for studying an academic discipline cannot exceed 100 points.

The overall final grade for the study of the academic discipline is determined according to the scale given in Table 2.

Table 2 – The scale for evaluating the knowledge of students based on the results of the final control of the academic discipline.

Evaluation in points	Evaluation by national scale		Evaluation according to the ECTS scale	
	exam	test	Rating	Criteria
90-100	Perfectly	Passed	**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 is estimated by the number of points close to the maximum

80–89	Good	Passed	**B**	B 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 in the training program have been completed, the quality of the execution of most of them has been evaluated with a number of points close to the maximum
75-79			**C**	The theoretical content of the course has been mastered completely, without gaps, some practical skills of working with the mastered material have not been sufficiently developed, all educational tasks provided for by the training program have been completed, the quality of the performance of none of them has been assessed with a minimum number of points, some types tasks were completed with errors
67-74	Satisfactory		**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			**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 evaluated with a number of points close to minimal

Evaluation in points	Evaluation by national scale		Evaluation according to the ECTS scale	
	exam	test	Assessment	Criteria
35–59	Unsatisfactorily	is not credited.		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 repeated drafting)

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 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;

- 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.pdf), "Academic Integrity. Checking the text of academic, scientific and qualification works for plagiarism" (https://www.khadi.kharkov.ua/fileadmin/P_Standart/pologeniya/stvnz_85_1_01.pdf), "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 Books:

1. Basic literature

1. Software Testing A Complete Guide. Gerardus Blokdyk. - Publisher : 5STARCooks (June 29, 2021). 313 pages
2. Effective Software Testing. Maurício Aniche. Publisher**:** Manning (April 26, 2022). 328 pages
3. Effective Software Testing. Maurício Aniche – Електронний посібник. March 2022 ISBN 9781633439931 328 pages - https://www.manning.com/books/effective-software-testing
4. Software Testing and Continuous Quality Improvement. William E. Lewis - Publisher: Auerbach Publications; 3rd edition (December 22, 2008). 688 pages
5. Advanced Software Testing - Vol. 3, 2nd Edition. Guide to the ISTQB Advanced Certification as an Advanced Technical Test Analyst 2nd Edition. Jamie L Mitchell, Rex Black. - Publisher: Rocky Nook. 2015. 480 pages

6. Software Testing 2020: Preparing for New Roles. Mukesh Sharma. - Publisher: Productivity Press. 2016.158 Pages
7. Evaluating Software Testing Techniques: A Systematic Mapping Study. Mitchell Mayeda. - chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://digitalcommons.du.edu/cgi/viewcontent.cgi?article=2599&context=etd
8. Software Quality Models in PracticeSurvey Results. Stefan Wagner Klaus Lochmann Sebastian Winter Andreas Goeb Michael Klaes Sabine Nunnenmacher - chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.klaes.org/Z-files/Software_Quality_Models_in_Practice.pdf
9. Why Evaluate Software Through Software Testing and QA. Mar 19, 2021 - https://www.syntacticsinc.com/news-articles-cat/software-testing-qa/

2. Additional sources:

1. A Methodological Framework for Evaluating Software Testing Techniques and Tools - file:///C:/Users/shapo/Downloads/QSIC2012-paper.pdf
2. Evaluating Software Testing Techniques and Tools - file:///C:/Users/shapo/Downloads/Evaluating_Software_Testing_Techniques_and_Tools.pdf
3. Video lectures on software testing - https://www.testingtv.com/category/software-testing-quality/
4. QA Best Practices: How to Do Smart TV Application Testing Right. 28 квітня 2021 р. Команда QA Exadel - https://exadel.com/news/qa-best-practices-how-to-do-smart-tv-application-testing-right/
5. Testing of Smart TV. Applications: Key Ingredients, Challenges and Proposed Solutions. May 2018. Conference: Future Technologies Conference - FTC 2018 At: Vancouver, BC, Canada. Project: Testing of Smart TV Applications. Bestoun S. Ahmed, Miroslav Bures. - https://www.researchgate.net/publication/325079895_Testing_of_Smart_TV_Applications_Key_Ingredients_Challenges_and_Proposed_Solutions/link/5c8b663a45851564fade6368/download
6. What Software Quality (Really) Is and the Metrics You Can Use to Measure It - https://www.altexsoft.com/blog/engineering/what-software-quality-really-is-and-the-metrics-you-can-use-to-measure-it/
7. What is software testing? - https://www.ibm.com/topics/software-testing#anchor--1233602719

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