Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Computer Systems Software Department

STANDARDIZATION AND TECHNOLOGIES FOR MULTIMEDIA AND INFORMATION RETRIEVAL SOFTWARE PRODUCTS DEVELOPMENT

Syllabus

1. Requisites of the Course

Cycle of Higher Education	***First cycle of higher education (bachelor's degree)***
Field of Study	*12 Information Technologies*
Speciality	*121 Software engineering*
Education Program	*Software Engineering of Multimedia and Information Retrieval Systems*
Type of Course	*Elective*
Mode of Studies	*full-time*
Year of studies, semester	*3 year (6 semester)*
ECTS workload	*5 credits (ECTS)., including 72 hours of classroom work, and 78 hours of self-study.*
Testing and assessment	*Exam, modular test*
Course Schedule	*http://rozklad.kpi.ua/*
Language of Instruction	*English*
Course Instructors	**Lecturer**: PhD, Associate Professor, Lesya Lyushenko, email LyushenkoL@gmail.com **Teacher of practical work**: PhD, Associate Professor, Lesya Lyushenko, email LyushenkoL@gmail.com
Access to the course	***MS Teams. Access to registered users.***MS Teams.

Outline of the Course

1. Course description, goals, objectives, and learning outcomes

The study of the discipline "Standardization and Technologies for Multimedia and Information Retrieval Software Products Development" allows students to form the competencies necessary for the use of theoretical knowledge and practical skills in standardizing software for solving practical problems of professional activity related to the development of software for multimedia and information retrieval systems with the implementation of international standards and modern development technologies .

***The purpose of** studying the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» is to form the ability of students to create software based on international, industry, professional standards and modern technologies.*

***The subject** of the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» are methods, technologies, standards used for the development of multimedia and information-search software products.*

Study of the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» contributes to the formation of students:

general competencies (GC)
GC 01 *Ability to abstract thinking, analysis and synthesis.*
GC 02 *Ability to apply knowledge in practical situations.*
GC 05 *Ability to learn and use modern knowledge.*

professional competencies (PC) *necessary for solving practical problems of professional activity related to the creation of information retrieval systems:*
PC02 *Ability to participate in software design, including its structure, behavior and functioning processes modeling (formal description).*
PC04 *Ability to formulate and ensure software quality requirements in accordance with customer requirements, specifications and standards.*
PC05 *Ability to follow specifications, standards, rules and recommendations in the professional field during the life cycle processes implementation software.*
PC19 *Ability to develop software for multimedia and mulsemedia systems.*

Study of the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» contributes to the formation of students of the following ***program learning outcomes*** *(PLO) in the educational program:*
PLO03 *To know the software life cycle basic processes, phases and iterations.*
PLO04 *To know and apply professional standards and other regulatory documents in the field of software engineering.*
PLO16 *To have the software development, design approval and all types of software documentation release skills.*
PLO17 *To be able to apply methods of component software development.*
PLO18 *To know and be able to apply information technology of processing, storage and transmission of data.*
PLO19 *To know and be able to apply software verification and validation methods.*
PLO32 *To be able to develop and analyze full cycle models for multimedia and information retrieval systems software creation.*
PLO33 *To be able to organize a software product management complete cycle.*
PLO36 *To be able to manage the creation and implementation of software projects in accordance with international standards.*
PLO37 *To know and to be able to manage the creation and implementation of software projects according to the standards PMBOK, SWBOK, BPMCBOK.*

2. Prerequisites and post-requisites of the course (the place of the course in the scheme of studies in accordance with curriculum)

The successful study of the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» is preceded by the study of the disciplines "Algorithms and Data Structures", "Programming" and "Components of Software Engineering" of the curriculum for the preparation of bachelors in the specialty 121 Software Engineering.

Theoretical knowledge and practical skills obtained during the assimilation of the discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» ensure the successful study of "Software Security", the implementation of course projects and bachelor's diploma projects in the specialty 121 Software Engineering.

3. Content of the course

The discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» involves the study of the following topics:

Topic 1. Introduction totandartization and technologies for the development of multimedia and information-search software productsand

Topic 2. Standards and technologies of software modeling

Topic 3. Standards and technologies of the software creation lifecycle

Topic 4. Software development technologies

Modular test work

Exam

4. Coursebooks and teaching resources

Basic reading

1. *Roger S. Pressman Software Engineering: A Practitioner's Approach 8th Edition. McGraw Hill. 2014. 976 p. ISBN-10:9780078022128, ISBN-13: 978-0078022128*
2. *Anatoly Volkhover Become an Awesome Software Architect: Book 1: Independently published. 2019. 190 p.ISBN-10 : 1697271065, ISBN-13 : 978-1697271065*
3. *Jorge Cardoso Handbook of Research on Business Process Modeling. Technische Universitat Eindhoven, The Netherlands 2009 634 p. DOI: 10.4018/978-1-60566-288-6*
4. *Introduction to Business Process Mapping with IDEF0 & IDEF3 Kindle Edition. Brian Hunt; File size: 1606 KB*
5. *John Long Morgan Kaufmann Process Modeling Style. 2014 73.p ISBN: 9780128010402 https://doi.org/10.1016/C2013-0-13505-2*

Further reading

6. *Robert C. Martin Series. Clean Architecture: A Craftsman's Guide to Software Structure and Design. Pearson. 2017. 432 p.ISBN-10:0134494164, ISBN-13:978-0134494166*
7. *Robert C. Martin Clean Code. Prentice Hall. 2011. 894 p.*
8. *Jeff Patton User Story Mapping: Discover the Whole Story, Build the Right Product. 2014. 324 p. ISBN 978-1491904909*
9. *Linda Null Essentials of Computer Organization and Architecture: Jones & Bartlett Learning; 2018 744 p ISBN-10: 1284123030;ISBN-13: 978-1284123036*
10. *BUSINESS ANALYSIS FOR PRACTITIONERS. A PRACTICE GUIDE. Project Management Institute. 2015. 206 p. ISBN: 9781628250695*
11. *Martin Schedlbauer The Art of Business Process Modeling: The Business Analyst's Guide to Process Modeling with UML & BPMN, 2010. 120 p. ISBN-10: 1450541666 ISBN-13: 978-1450541664*
12. *Business Process Modelling with BPMN: Modelling And Designing Business Processes Course Book Using The Business Process Model and Notation Specification Version 2.0 Paperback. 2012 136 p. ISBN-10: 1479118052 ISBN-13: 978-1479118052*

Use to master the practical skills of the discipline. The materials are freely available on the Internet.

Educational content

5. Methods of mastering the discipline (educational component)

№	Type of training session Description	Description of the training session
Topic 1. Introduction to standardization and technologies for the development of multimedia and information-search software products		
1	*Lecture 1. Course content, Overview of Software Engineering Standards*	*Course content, review of software engineering standards. SWEBOK. Standard structure*

2	Lecture 2. Overview of software development technologies	Technologist of software development. Fundamentals of the principle of technology. Process approach.
3	Workshop № 1	Selection, description and justification of cases for laboratory workshop
Topic 2. Standards and technologies of software modeling		
4	Lecture 3. Fundamentals of modeling. (Part 1) Lecture 3. Fundamentals of modeling. (Part 2)	The concept of model. Modeling objectives. Principles of modeling. Using modeling principles to build information models. These models are the basis for software design and development and information systems construction. Modeling technologies
5	Workshop № 2	Setting up a modeling model. Conversion diagram. Process structure.
6	Lecture 4. Modeling of complex systems. (Part 1) Lecture 4. Modeling of complex systems. (Part 2)	Modeling as the main technology of software creation. Modeling objectives and model adequacy. Notation modeling software. Approaches to modeling complex systems
7	Workshop № 3	Create functional model. Decomposition.
8	Lecture 5. Functional modeling. Modeling Standards (Part 1) Lecture 5. Functional modeling. Modeling Standards (Part 2)	Process approach in software modeling. Modeling standards. IDEF, UML, etc. notations .
9	Workshop № 4	Scenario modeling.
10	Lecture 6. Modeling of information flows of software systems	Data Flow Diagram (Data Flow Diagram) is used to simulate data transfer (flows) and information processing. DFD diagrams are usually built to visually display information flows in software systems.
11	Workshop № 5	The sub-track of the information model. Reports. Process tree.
Topic 3. Standards and technologies of the software creation lifecycle		
12	Lecture 7 Software Creation Lifecycle Standards (Part 1) Lecture 7 Software Creation Lifecycle Standards (Part 2)	ISO/IEC 12207:2016 Systems and software engineering. Software lifecycle processesSystems and software engineering. Software lifecycle processes (ISO/IEC 12207:2008, IDT) International standards ISO. Organization standards IEEE. The maturity standard of a software company. Standard SPICE.
13	Lectures 8 Standards for the quality of software creation and operation	Quality: functionality, reliability, ease of use, ease of maintenance, efficiency, portability. The ability of the software product under specified conditions to meet the established or expected needs. Standards 1061-1998 IEEE Standard for Software Quality Metrics Methodology] [IEEE Std 610.12-1990], ISO/IEC 25000:2014, ISO 8402:1994 Quality management and quality assurance
Topic 4. Software development technologies		

14	Lecture 9 Strategies and technologies of software development (Part 1) Lecture 9 Strategies and Technologies for Software Development (Part 2)	Rigid and flexible strategies in programming methodologies. Rational Unified Process (RUP) methodology. Microsoft Solution Framework (MSF) Methodology eXtreme Programming (XP)
15	Lecture 10. Flexible software development	Agile-based flexible software development. Software architecture. Architecture description standards
Modular test		
Exam		

6. Self-study

The discipline «Standardization and Technologies for Multimedia and Information Retrieval Software Products Development» is based on independent preparations for classroom classes on theoretical and practical topics.

№	The name of the topic submitted for independent study	Hours	Literature
1	Preparing for lecture 1	2	1; 2; 8
2	Preparing for lecture 2	2	1; 2, 10
3	Preparation for a computer workshop №1	4	1; 2; 8; 10
4	Preparing for lecture 3 (P1,P2)	2	3,4, 9
5	Preparation for a computer workshop №2	4	3; 4; 10
6	Preparing for the lecture 4 (P1,P2)	2	3; 5; 10
7	Preparation for a computer workshop №3	4	1,3, 5
8	Preparing for the lecture 5 (Ч1,Ч2)	2	3,4,9,8
9	Preparation for a computer workshop №4	4	2; 3, 4,5
10	Preparing for the lecture 6	2	1,7,8
11	Preparation for a computer workshop №5	4	2; 3, 4,5
12	Preparing for the lecture 7(P1,P2)	2	2; 6,7
13	Preparing for the lecture 8	2	2; 6
14	Preparing for the lecture 9 (P1,P2)	2	1,6,7
15	Preparing for the lecture 10	2	2,6,7
16	Preparation for the modular test	8	1-12
17	Exam preparation	30	1-12

Politics and control

Policy of the discipline (educational component)

Attendance of lectures is mandatory.

Attendance at computer workshop classes can be episodic and, if necessary, consultation/defense of computer workshops.

Rules of conduct in the classroom: activity, respect for those present, disconnection of phones.

Adherence to the policy of academic integrity.

Rules for the protection of computer workshops: work must be done in accordance with the tasks and in accordance with the version.

Types of control and rating system for evaluating learning outcomes

During the semester, students perform 5 computer workshops. ***The maximum number of*** *points for each computer workshop: 8 points.*

Points are awarded for:
- quality of computer workshop: 0-4 points;
- answer during the protection of a computer workshop: 0-2 points;
- timely submission of work to the defense: 0-2 points.

Criteria for assessing the quality of performance:
4 points – the work was performed efficiently, in full;
3-2 points – the work is performed efficiently, in full, but has drawbacks;
1-2 points – the work has been completed in full, but contains significant errors;
0 points – the work is not completed in full.

Criteria for evaluating the answer:
2 points – the answer is complete, well-reasoned;
1 point – there are significant errors in the answer;
0 points – no answer or the answer is incorrect.

Criteria for assessing the timeliness of the submission of work to the defense:
2 points – the work is submitted to the defense no later than the specified period;
0 points – the work is submitted to the defense later than the specified period.

The maximum number of points for the implementation and protection of computer workshops:
8 points × 5 comp. pract. = 40 points.

The task for ***the modular test consists*** *of 2 practical questions. The answer to each question is estimated at 5 points.*

Criteria for evaluating each test question:
5 points – the answer is correct, complete, well-reasoned;
4-2 points – in general, the answer is correct, but has drawbacks;
1 point – there are significant errors in the answer;
0 points – no answer or the answer is incorrect.

The maximum number of points for a modular test:
5 points × 2 questions = 10 points.

Calendar control: is carried out twice a semester as a monitoring of the current state of compliance with the requirements of the syllabus.
At the first certification (8th week), the student receives "enrolled" if his current rating is at least 10 points (50% of the maximum number of points that a student can receive before the first certification).
At the second certification (14th week), the student receives "enrolled" if his current rating is at least 20 points (50% of the maximum number of points that a student can receive before the second certification).

Semester control: exam
Conditions of admission to semester control:
With a semester rating (R_C) of at least 30 points, all works of the computer workshop are credited and a modular test paper is performed, the student has admission to the exam. After passing the exam, a score is set in accordance with the table (Table of compliance of rating points with grades on a university scale).

A prerequisite for admission to the exam is the implementation and protection of a computer workshop.

Examination paper consists of 3 theoretical and 2 practical
Questions. The answer to each question is estimated at 10 points.
Criteria for evaluating each question of the examination paper:
9-10 points – the answer is correct, complete, well-reasoned;
7-8 points – the answer is correct, detailed, but not very well reasoned;
5-6 points – in general, the answer is correct, but has drawbacks;
3-4 points – there are minor errors in the answer;
1-2 points – there are significant errors in the answer;
0 points – no answer or the answer is incorrect.
Maximum number of points for examination work:
10 points × 5 questions = 50 points.

The rating scale for the discipline is equal to:
$R = R_C$ *= 40 points + 10 points + 50 points = 100 points.*

Table of correspondence of rating points to assessments on a university scale:

Score	***Score***
100-95	Perfectly
94-85	Very good
84-75	Well
74-65	Satisfactory
64-60	Enough
Less than 60	Disappointing
Admission conditions not met	Not allowed

Additional information on the discipline (educational component)

The list of questions submitted for semester control is provided in Appendix 1.

Work program of the discipline (syllabus):

Compiled by Candidate of Technical Sciences, Associate Professor, L.A. Liushenko

Adopted by Computer Systems Software Department (protocol № 12 from 26.04.23)

Approved by the Faculty Board of Methodology (protocol № 10 from 26.05.23)

Annex 1. The list of questions that are submitted for semester control

1. *The influence of the external environment on the creation of modern information systems*
2. *Ontological (conceptual) field of a modern company from the point of view of information systems*
3. *Business model of a software product*
4. *Context chart*
5. *The main sources of information about customer needs*
6. *Approach with the use of product use cases*
7. *Use cases and use cases*
8. *Definition of use cases*
9. *Documenting use cases*
10. *Product use cases and functional requirements*
11. *The advantages of the method using use cases*
12. *Definition of concepts model, modeling , model adequacy*
13. *Classification of models (types of modeling).*
14. *The life cycle of IC. Formation of the life cycle of IC*
15. *Determination of requirements for IC. Requirements analysis stage*
16. *Design stage. Features of the design of information systems.*
17. *The stage of implementation of IC involves the development and testing of components and comprehensive testing of the system*
18. *Place of modeling in the process of creating an information system . Stages of building an information system model.*
19. *Methodical bases of software creation technologies. Visual modeling*
20. *CASE-technology. SADT-based modeling.*
21. *Definition of the process, business process (business process). Graph model of the process.*
22. *Graph-model of the process is IDEF0 notation. Types of relationships of blocks of the functional model IDEF0*
23. *IDEF0 decomposition. Principles for limiting the complexity of IDEF0 diagrams*
24. *Decomposition of the robot . The structure of the decomposition of the robot.*
25. *Development of technological maps. Using IDEF0 diagrams*