Syllabus
Course Program

Software requirements engineering

Specialty
121 – Software Engineering

Institute
Institute of Computer Science and Information Technology

Educational program
Software Engineering

Department
Software Engineering and Management Intelligent Technologies (321)

Level of education
Bachelor's level

Course type
Special (professional), Mandatory

Semester
4

Language of instruction
English, Ukrainian

Lecturers and course developers

Valentyna Moskalenko

Valentyna.Moskalenko@khpi.edu.ua
Doctor of Technical Sciences, Professor, Professor of SEMIT Department.
Number of scientific and educational publications is more than 100, 13 articles in publications indexed in Scopus.
(https://publons.com/researcher/1588564/valentyna-moskalenko/;
Web of Science ResearcherID R-9960-2018;
https://scholar.google.com.ua/citations?user=eUidJHIAAAAJ&hl;
https://www.scopus.com/authid/detail.uri?authorId=36021571200;
https://orcid.org/0000-0002-9994-5404)
Leading lecturer in disciplines: "Fundamentals of computer science and artificial intelligence methods", "Probability theory and mathematical statistics", "Business analysis methods for requirements management", "Methods of computational intelligence", "Software requirements engineering", "Fundamentals of Machine Learning", "Introduction to neural networks".
Scientific directions: development of information systems for strategic company management; application of computer intelligence methods and models for solving problems of managing complex organizational systems; business analytics.
More about the lecturer on the department's website

General information

Summary

The subject of the discipline is the main aspects of software requirements management throughout the software development cycle. Students gain knowledge about the types of user requirements, features of their formation and methods of formulating requirements by business analysts, methods of analysis and certification of requirements for different types of software systems, knowledge of the potential risks associated with the requirements; knowledge of software requirements management techniques; skills in resolving conflicts between requirements of different types; skills of application of tools for development of user requirements.

Course objectives and goals

The objectives are theoretical and practical training of students in the field of software requirements engineering, students gain practical skills in analysis and modeling of the problem area, development of requirements specifications, as well as skills of management requirements throughout the software life cycle.

Format of classes

Lectures, laboratory classes, consultations. Final control is a test.

Competencies

K04. Ability to communicate in a foreign language both orally and in writing.
K05. Ability to learn and master modern knowledge.
K06. Ability to search, process and analyze information from various sources.
K13. Ability to identify, classify and formulate software requirements.
K14. Ability to participate in software design, including modeling (formal description) of its structure, behavior and processes of functioning.
K16. Ability to formulate and ensure software quality requirements in accordance with customer requirements, terms of reference and standards.
K17. Ability to comply with specifications, standards, rules and guidelines in the professional field when implementing life cycle processes.
K18. Ability to analyze, select and apply methods and tools to ensure information security (including cybersecurity).
K23. Ability to implement phases and iterations of the life cycle of software systems and information technologies based on appropriate software development models and approaches.
K24. Ability to carry out the system integration process, apply change management standards and procedures to maintain the integrity, overall functionality and reliability of the software.
K25. Ability to reasonably choose and master the tools for software development and maintenance.
K26. Ability to think algorithmically and logically.

Learning outcomes

PLO01. Analyze, purposefully search and select information and reference resources and knowledge necessary for solving professional problems, taking into account modern achievements of science and technology.
PLO03. Know the basic processes, phases and iterations of the software life cycle.
PLO09. To know and be able to use methods and tools for collecting, formulating and analyzing software requirements.
PLO10. Conduct a pre-project survey of the subject area, system analysis of the design object.
PLO11. Select input data for design, guided by formal methods of requirements description and modeling.
PLO14. Apply in practice software tools for domain analysis, design, testing, visualization, measurement and documentation of software.
PLO19. To know and be able to apply methods of software verification and validation.
PLO23. Be able to document and present the results of software development

Student workload

The total volume of the course is 120 hours (5 ECTS credits): lectures - 16 hours, laboratory classes - 32 hours, self-study - 72 hours.

Course prerequisites

The basis of studying the discipline is general knowledge of modeling and software development.

Features of the course, teaching and learning methods, and technologies

Teaching and learning methods:

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interactive lectures with presentations, discussions, laboratory classes, teamwork, case method, student feedback, problem-based learning.

Forms of assessment:

written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), express surveys (CAS), online tests (CAS), final/semester control in the form of a semester test, according to the schedule of the educational process (FAS).

Program of the course

Topics of the lectures

Topic 1. Foundation of software requirements engineering.

Defining requirements as a stage of software development. Classification of requirements. Levels of requirements according to K. Wiggers; classification within the SWEBOK concept; RUP classification (FURPS +), etc. Key concepts of business analysis according to the Business Analysis Body of Knowledge (BABOK)

Topic 2. Techniques and methods for identifying requirements.

The forming requirements process. Examination and cooperation. Methods for examination and support of cooperation. Management of interactions with stakeholders. Methods for identifying software requirements and software design. Problems of requirements formation and approaches to their solution.

Topic 3. Analysis of requirements and assessment of the software solution value.

Requirements analysis and design definition. Using modeling methods to analyze requirements. Evaluation of the value, limitations of the software solution and analysis of performance indicators. Software quality attributes. Methods of assessing the business value obtained after the implementation of the software. Analyzing the effectiveness of the business solution.

Topic 4. Requirements life cycle management.

Requirements tracing. Maintaining the relevance of requirements. Prioritization. Assessment of changes in requirements. Approval of requirements. Software requirements testing. Requirements management features for different models of software development

Topic 5. Requirements life cycle management according to the Agile methodology.

Features of requirements management according to the Agile software development methodology. Development of requirements according to the SCRAM, development of User stories and construction of Story Mapping.

Topic 6. Modern perspectives application in the practice of software requirements engineering.

Application practices of modern perspectives of Business Intelligence, Business Architecture, etc. ITIL concept and requirements management

Topics of the workshops

Workshops are not provided within the discipline.

Topics of the laboratory classes

Topic 1. Business analysis methods for developing business requirements and the Software Requirements Specification.

Topic 2. Formation and analysis of requirements according to the Agile methodology. Development of User stories and Story Mapping in SCRAM.

Topic 3. Software requirements management in Confluence and Jira.

Self-study

Topic 1. Foundation of software requirements engineering.

SWEBOK Knowledge Areas and Relationships with Requirements Management.

Topic 2. Techniques and methods for identifying requirements.

Different methods of generating ideas.

Topic 3. Analysis of requirements and assessment of the software solution value.

Types of software prototyping

Topic 4. Requirements life cycle management.

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The software life cycle.
Calculation task: Prioritize requirements according to the Kano model and MoSCoW.
Topic 5. Requirements life cycle management according to the Agile methodology.
Features of software development models (waterfall, iterative, spiral, flexible models)

Students are recommended with additional materials (videos, articles) for self-study and processing

Course materials and recommended reading

Key literature
1. Guide to Software Engineering Body of Knowledge (SWEBOK). IEEE Computer Society, 2014 //https://ieeecs-media.computer.org/media/education/swebok/swebok-v3.pdf
2. A Guide to the Business Analysis Body of Knowledge® (BABOK® Guide). (2015) International Institute of Business Analysis, Toronto, Ontario, Canada. Version 3.0.
3. The Agile Extension to the BABOK® Guide (2017) //https://www.agilealliance.org/resources/initiatives/agile-extension-to-the-babok-guide/
4. Wiegers K., Beatty J. (2013) Software Requirements (Developer Best Practices), 3rd Edition, Microsoft Press, 672 p.
5. Pohl K., Rupp C. (2015) Requirements Engineering Fundamentals: A Study Guide for the Certified Professional for Requirements Engineering Exam: Foundation Level -- IREB Compliant, 2nd Edition, 163p.
6. Dick, J., Hull, E., & Jackson, K. (2017). Requirements Engineering. (4rd ed.) Springer. https://doi.org/10.1007/978-3-319-61073-3
7. Biazid D. (2021) Requirements Development Guidebook. CreateSpace Independent Publish.

Additional literature
1. Cadle J., Paul D., Turner P. (2014) Business Analysis Techniques: 99 essential tools for success, 2nd ed.: BCS Learning & Development Limited.
2. Girvan L. (2017) Agile and Business Analysis Practical guidance for IT professionals. BCS Learning & Development Limited.
3. Leffingwell D. (2010) Agile Software Requirements: Lean Requirements Practices for Teams, Programs, and the Enterprise (Agile Software Development Series) 1st Edition, Addison-Wesley Professional, 560 p.
4. Business Analysis Fundamentals // https://projectmanagementacademy.net/business-analysis-fundamentals.
5. Mall R. (2014) Fundamentals of Software Engineering, 4Th Ed., Prentice-Hall of India Pvt.Ltd, 544p.
6. Turner P., Cadle J. (2020) Business Analysis Techniques. 4th ed., Edition- Revised Edition.
7. The PMI Guide to Business Analysis (Paperback) (2018). Project Management Institute.

Assessment and grading

Criteria for assessment of student performance, and the final score structure

100% final assessment in the form of a test (10%) and a current assessment (90%).
10% credit: semester credit, according to the schedule of the educational process 90% current assessment:
- 75% assessment of tasks in laboratory works;
- 15% assessment of calculated tasks.

Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.
Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/

Approval

Approved by	08.06.2023	Head of the department Ihor HAMAIUN
	08.06.2023	Guarantor of the educational program Uliya LITVINOVA