



Syllabus Course Program



Analysis of requirements for software systems

Specialty

113 Applied mathematics

Educational program

Intelligent Data Analysis

Level of education

Bachelor's level

Semester

5

Institute

Educational and Scientific Institute of Computer Science and Information Technology

Department

Computer Mathematics and Data Analysis

Course type

Special (professional), Selective

Language of instruction

Ukrainian

Lecturers and course developers



Olga Tevyasheva

olga.tevyasheva@khpi.edu.ua

Candidate of physical-mathematical sciences, associate professor, associate professor of Computer mathematics and data analysis Department (NTU "KhPI").

Work experience - more than 20 years. Author of many scientific works.

[More about the lecturer on the department's website](#)

General information

Summary

Methods and tools necessary for effective analysis, collection, documentation and management of requirements for software systems are considered. During the course, students get acquainted with the main types of requirements, methods and techniques of their collection, modeling and validation. They learn to manage changes in requirements and effectively interact with customers and developers. In addition, the course covers specific aspects of requirements analysis in Agile and other development methodologies, and examines requirements analysis in different contexts such as artificial intelligence systems, mobile applications, and web applications.

Course objectives and goals

The discipline is aimed at acquiring the necessary competencies in the direction of developing software requirements. The main principles and methods of analysis of requirements for software systems, various techniques of their collection and documentation, methods of validation and verification of requirements are considered. effective management of changes in requirements during the life cycle of the project. Special attention is paid to the development of communication skills with customers and other project participants for the successful analysis of requirements, which should prepare students for professional activities.

Format of classes

Lectures and laboratory classes, self-study, consultations. Final control – exam.

Competencies

GC 1. Ability to learn and master modern knowledge.
GC 2. Ability to apply knowledge in practical situations.
GC 7. Ability to search, process and analyse information from various sources.
GC 8. Knowledge and understanding of the subject area and understanding of professional activities.
GC 10. Skills in the use of information and communication technologies.
SC 5. Ability to develop algorithms and data structures, software tools and program documentation.
SC 6. Ability to design databases, information systems and resources. |

Learning outcomes

LO 11. Be able to apply modern programming technologies and software development, software implementation numerical and symbolic algorithms.
LO 12. Solve individual engineering problems and/or tasks that arise in at least one subject area: sociology, economy, ecology, and medicine.
LO 13. To use specialized software programs in practical work products and software systems for computer mathematics.
LO 14. Demonstrate the ability to self-learn and continue professional development.
LO 15. Be able to organize your own activities and get results within a limited time frame.
LO 16. Demonstrate skills of interaction with other people, ability to work in a team. |

Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures – 30 hours, laboratory classes – 30 hours, self-study – 60 hours. |

Course prerequisites

IT project management |

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

Gamification and peer-to-peer are used. |

Program of the course

Topics of the lectures

Topic 1. Introduction to the analysis of requirements for software systems.

Definition of software requirements. The importance of requirements analysis in the development process. Roles and responsibilities of requirements analyst.

Topic 2. Main types of requirements.

Functional requirements. Non-functional requirements.

Topic 3. Requirements gathering techniques.

Interview with the customer. Observation of the work process. Questionnaire. Prototyping. Workshops and focus groups.

Topic 4. Modeling of requirements.

Using UML. Use Case diagrams. Diagrams of classes and objects. Sequence diagrams of business processes.

Topic 5. Tracing requirements.

Trace process. Using requirements tracing tools. Examples of requirements tracing in real projects.

Topic 6. Prioritization of requirements.

Methods of prioritizing requirements. MoSCoW matrix. Analysis of cost and prioritization of requirements.

Topic 7. Validation of requirements.

Requirements testing. Check for compliance with business goals. Customer feedback. Examples of requirements validation techniques.

Topic 8. Documentation of requirements.

The structure of the requirements document. Examples of requirements documentation. Using templates for documentation.

Topic 9. Management of changes to requirements.

Change management process. Identification of changes. Evaluation of the impact of changes. Making a decision on making changes.

Topic 10. Communication with the customer.

The importance of effective communication. Techniques of effective communication with the customer. Work with conflicts and disagreements.

Topic 11. Requirements for Agile development.

Roles in the Agile process. Agile principles. Application of Agile requirements analysis methods.

Topic 12. Requirements for intelligent systems.

Peculiarities of requirements analysis for artificial intelligence systems. Methods of working with vague requirements. Examples of application in various fields.

Topic 13. Requirements in mobile development.

Features of requirements analysis for mobile applications. Management of adaptability and responsiveness of the interface. Security and performance requirements.

Topic 14. Requirements of web applications.

Peculiarities of requirements for web applications. Interface design. Session management and security.

Topic 15. Designing requirements for scalable systems.

Methods and approaches for designing requirements for systems that can scale efficiently as data, users, and workloads grow. |

Topics of the workshops

|Not provided for in the curriculum. |

Topics of the laboratory classes

|Topic 1. Analysis of requirements for a simple software product. Conducting an interview with a potential customer, identifying the main requirements, documenting them and creating a basic set of functional and non-functional requirements.

Topic 2. Collection of requirements on the example of a real project using various techniques (interviews, observations, questionnaires) and documentation of the received requirements.

Topic 3. Prototyping the application interface and testing the prototype with potential users.

Topic 4. Visualization, formalization and modeling of requirements using UML

Topic 5. Tracing to link requirements to elements of design, code, and testing.

Topic 6. Prioritization of requirements using MoSCoW methods and cost analysis, determination of the most important and critical requirements for successful project implementation.

Topic 7. Validation of requirements (development of test scenarios and testing of requirements for compliance with business goals and customer expectations).

Topic 8. Documenting requirements for functionality, performance, security and interface according to standards.

Topic 9. Management of changes in requirements and assessment of their impact on the project.

Topic 10. Communication with stakeholders to discuss requirements, identify new needs and resolve conflicts.

Topic 11. Analysis of requirements in the context of an Agile project

Topic 12. Analysis of requirements for artificial intelligence systems in view of the specifics of working with fuzzy and dynamic requirements.

Topic 13. Analysis of requirements for mobile applications taking into account adaptability, performance and data security.

Topic 14. Analysis of requirements for web applications.

Topic 15. Analysis of requirements for a system with a distributed architecture. |

Self-study

|The course involves individual assignments. Their solutions are checked, monitored and evaluated by teachers. Students are also recommended additional materials (videos, articles) for self-study. |

Non-formal education

|Not provided for in the curriculum. |

Course materials and recommended reading

Basic literature

1. Karl Wiegers, Candase Hokanson Software Requirements Essentials: Core Practices for Successful Business Analysis – Pearson, 2023. – 208 с. ISBN 978-013-819-028-6
2. Мартин Р. Чистий AGILE. Назад до основ – Фабула, 2021 – 224 с. – ISBN 978-617-09-6760-2
3. Піхлер Р. Книга Agile продукт-менеджмент за допомогою Scrum. Створення продуктів, що подобаються клієнтам. – Фабула, – 2019. – 128 с. – ISBN 978-617-09-5402-2
4. Thomas Hathaway, Angela Hathaway Getting and Writing IT Requirements in a Lean and Agile World: Business Analysis Techniques for Discovering User Stories, Features, and Gherkin Scenarios – Independently published, 2019. – 364с. – ISBN 978-107-648-167-2
5. Fred Heath Managing Software Requirements the Agile Way – Packt Publishing Limited, – 2020. – 214 с. ISBN 978-180-020-646-5

Secondary literature

6. Karl Wiegers, Candase Hokanson Software Requirements Essentials: Core Practices for Successful Business Analysis – Pearson, 2023. – 208 с. ISBN 978-013-819-028-6
7. Мартин Р. Чистий AGILE. Назад до основ – Фабула, 2021 – 224 с. – ISBN 978-617-09-6760-2
8. Піхлер Р. Книга Agile продукт-менеджмент за допомогою Scrum. Створення продуктів, що подобаються клієнтам. – Фабула, – 2019. – 128 с. – ISBN 978-617-09-5402-2
9. Thomas Hathaway, Angela Hathaway Getting and Writing IT Requirements in a Lean and Agile World: Business Analysis Techniques for Discovering User Stories, Features, and Gherkin Scenarios – Independently published, 2019. – 364с. – ISBN 978-107-648-167-2
10. Fred Heath Managing Software Requirements the Agile Way – Packt Publishing Limited, – 2020. – 214 с. ISBN 978-180-020-646-5
11. <https://visuresolutions.com/requirements-management-traceability-guide/requirements-analysis/>
12. <https://www.iiba.org/> - веб-сайт International Institute of Business Analysis (IIBA)
13. https://habr.com/ru/search/?q=%D0%B0%D0%BD%D0%B0%D0%BB%D0%B8%D0%B7%D1%82%D1%80%D0%B5%D0%B1%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B9&target_type=posts&order=relevance

Assessment and grading

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

100% of the final grade consists of the results of the assessment in the form of an exam (40%) and the current assessment (60%).

Exam: written task (2 theoretical and task) and oral report.

Current assessment: grades for laboratory work, 2 tests and individual assignments.

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

Date, signature
29.08.2024



Head of the department
Olena AKHIEZER

Date, signature
29.08.2024



Guarantor of the educational
program
Olena AKHIEZER