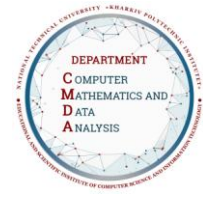




Syllabus Course Program



Systems development lifecycle

Specialty

113 Applied mathematics

Educational program

Intelligent Data Analysis

Level of education

Bachelor's level

Semester

7

Institute

Institute of Computer Science and Information Technology

Department

Computer mathematics and data analysis

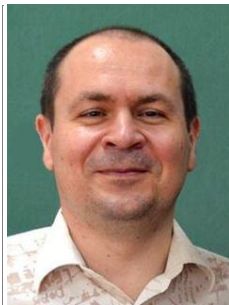
Course type

Special (professional), Selective

Language of instruction

Ukrainian

Lecturers and course developers



Dmytro Yelchaninov

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Candidate of Technical Sciences, Associate Professor, Associate Professor of the Department of Computer Mathematics and Data Analysis

He has 24 years of experience. Author of 150 scientific and educational works. Leading lecturer in the following disciplines: "Methods and tools of computational mathematics", "Principles and paradigms of Python", "Development of web services in Python", "Algorithmic languages", "Mathematical modeling of complex systems", "Design of consolidated information systems", "Fundamentals of business analytics", "Analysis of expert information".

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

General information

Summary

The course covers key aspects of software development, from concept to deployment and support. In this course, students will become familiar with various software development models and methodologies. They will learn how to plan, analyze, design, develop, test, and manage software projects, as well as how to ensure their security and support at various stages of the life cycle. Particular attention is paid to the development of skills that will allow students to become highly skilled software engineers capable of effectively implementing innovative solutions in the world of information technology.

Course objectives and goals

The discipline consists of studying and understanding the understanding of key concepts, models and methodologies used in software development, as well as mastering modern tools and technologies. The objectives include developing students' skills in project management, software requirements and quality, and learning to apply agile development methodologies. The course aims to prepare students to solve real-world problems in software development, including risk management and data security.

Format of classes

Lectures, laboratory classes, self-study, consultations. The final control is an exam. |

Competencies

GC 1. Ability to learn and master modern knowledge.

GC 2. Ability to apply knowledge in practical situations.

GC 3. Ability to generate new ideas (creativity).

GC 4. Ability to be critical and self-critical.

GC 7. Ability to search, process and analyze 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 3. Ability to select and apply mathematical methods to solve applied problems, modeling, analysis, design, management, forecasting, and decision-making.

SC 5. Ability to develop algorithms and data structures, software tools and program documentation.

SC 6. Ability to design databases, information systems and resources.

SC 8. Ability to operate and maintain software of automated and information systems for various purposes.

SC 10. Ability to make mathematical and computer modeling, data analysis and processing, computational experiment, solving formalized problems with the help of specialized software tools.

SC 21. Ability to develop and operate software tools for processing large amounts of data based on information technologies of distributed and cloud computing. |

Learning outcomes

LO 1. Demonstrate knowledge and understanding of the basic concepts, principles, theories of applied mathematics and apply them in practice.

LO 10. Know how to choose rational methods and algorithms for solving mathematical problems of optimization, operations research, optimal management and decision-making, and data analysis.

LO 11. Be able to apply modern technologies of programming and software development, software implementation of numerical and symbolic algorithms.

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 25. Be able to apply modern information technologies and software for processing large amounts of data based on distributed and cloud services. |

Student workload

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

Course prerequisites

Successful completion of the course requires knowledge and skills in the following courses: "IT project management", 'Analysis of requirements for software systems', "Fundamentals of business analytics". |

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

Lectures are conducted interactively with the use of multimedia technologies. When teaching this discipline, we use such teaching and learning methods as gamification and peer-to-peer. |

Program of the course

Topics of the lectures

Topic 1. Introduction to the systems development life cycle

The system and its life cycle. Different models of the development life cycle.

Topic 2. Waterfall model of development

Description of the waterfall model. Life cycle phases: requirements definition, design, realization, testing, implementation. Advantages and disadvantages of the waterfall model.

Topic 3. Iterative and incremental development models

Linear model, spiral model, Agile, Scrum, RUP. Advantages and disadvantages.

Topic 4. Project management methodology

The main stages of project management. Methodologies: PMBOK, Prince2, Kanban. Roles of project participants.

Topic 5. Pre-sale stage

The main tasks and goals of the pre-sales stage. The process of assessing customer requirements and analyzing business needs. Development of proposals and commercial terms for the client.

Topic 6. Planning and launching the project

Key aspects of a successful project launch: setting goals, allocating resources, and forming a team. The role of technical consulting.

Topic 7. System design

Architectural styles and templates. Designing classes and components. Principles of SOLID.

Topic 8. Software development and testing

Programming methods: testing, debugging, refactoring. Types of testing: module, integration, system, acceptance.

Topic 9. Configuration management

Configuration. Versioning. Versioning tools: Git, SVN.

Topic 10. Deployment and support

The process of software deployment. Change and update management. Technical support and maintenance.

Topic 11. Risk management

Identification of risks. Risk analysis and assessment. Planning of risk management measures.

Topic 12. Software quality and testing

Software quality assessment. Methods of quality testing. Quality analysis and improvement processes.

Topic 13. Project and development team management

Organizational structures of development teams. Motivation and team management. Effective interaction with the customer and stakeholders.

Topic 14. DevOps and Continuous Integration/Continuous Deployment

Definition of DevOps and its principles. Implementation of CI/CD in the development process.

Topic 15. Project completion and software delivery

Project completion stages: final testing, optimization, documentation. The process of preparing for market entry: market analysis, marketing, launch planning. Compatibility issues, bug fixes, user feedback.

Topics of the workshops

[There are no workshops in the curriculum.]

Topics of the laboratory classes

Topic 1. Development of a life cycle model

Topic 2. Planning the implementation of the waterfall model

Topic 3. Developing a project plan based on an iterative model

Topic 4. Distribution of roles and responsibilities in the project development team

Topic 5. Identification of client requirements at the pre-sale stage. Development of proposals and commercial terms for the client.

Topic 6. Planning the project launch, allocating resources

Topic 7. Designing the system architecture

Topic 8. Development of software testing scenarios. Risk assessment.

Topic 9. Creating and managing a project repository with Git

Topic 10. Developing a plan for software deployment and post-release support.

Topic 11. Identification and assessment of project risks. Development of a risk management plan

Topic 12. Performing software quality testing and analyzing its results. Developing a software quality improvement plan.

Topic 13. Development planning using the Gantt chart. Organization of interaction with the customer

Topic 14. Setting up the CI/CD system

Topic 15. Preparation of documentation for software launch on the market |

Self-study

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

Non-formal education

Software Development Lifecycle Specialization [4 courses] (UMN) | Coursera
<https://www.coursera.org/specializations/software-development-lifecycle> |

Course materials and recommended reading

1. The Project Management and A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Project Management Institute, 2021. – 274 с. – ISBN 978-162-825-664-2
2. Eric Verzuh The Fast Forward MBA in Project Management: The Comprehensive, Easy-to-Read Handbook for Beginners and Pros – Wiley, 2021. – 544 с. – ISBN 978-111-970-076-0
3. Sommerville, Ian. Engineering Software Products: An Introduction to Modern Software Engineering. - Pearson, 2019. - 342 с. – ISBN 978-013-521-064-2
4. Апелло Ю. Менеджмент 3.0. Agile-менеджмент. Лідерство та управління командами – Фабула, 2019. – 432 с. – ISBN 978-617-09-5264-6
5. Дебуа П., Вілліс Д., Кім Д., Хамбл Д. DevOps. Посібник – Фабула, 2023. – 384 с. – ISBN 978-617-09-7984-1
6. Андерсон Д. Канбан. Успішні еволюційні зміни для вашого технологічного бізнесу. - Фабула, 2021. – 288 с. – ISBN 978-617-09-5576-0
2. Stanley E. Portny Project Management All-in-One For Dummies - For Dummies, 2020. – 608 с. – ISBN 978-111-970-026-5
7. Paul Roberts The Economist Guide To Change And Project Management: Getting it right and achieving lasting benefit - Economist Books, 2020. – 448 с. – ISBN 978-178-816-603-4
8. <https://www.pmi.org/pmbok-guide-standards/foundational/pmbok> – Project Management Body of Knowledge (PMBOK) |

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 examination (40%) and the current assessment (60%).

Examination: written assignments (2 theoretical and a problem) and an 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