# ARCHITECTURE OF CORPORATE INFORMATION SYSTEMS

COURSE SYLLABUS

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| **Code and name of specialty** | 121 Software Engineering<br>122 Computer Science<br>126 Information Systems and Technologies | **Institute** | **Computer Sciences and Software Engineering** |
| **Program name** | Software Engineering<br>Computer Science and Intelligent Systems<br>Information Systems Software | **Department** | Software Engineering and Management Information Technologies |
| **Type of program** | **Educational and Professional** | **Language of instruction** | **Ukrainian, English** |

## LECTURER


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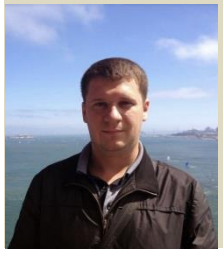

**PhD, Candidate of Engineering Sciences, Associate Professor of Department of Software Engineering and Information Technology Management.**
**Leading lecturer of the courses: Architecture of corporate information systems** *(Bachelors) (Ukrainian, English)*


## GENERAL DESCRIPTION OF THE COURSE

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| **Summary** | The course “Architecture of corporate information systems” is an optional course in the profiled discipline package 03 “Innovation campus” of the specialties 121 “Software Engineering”, 122 “Computer Science”, and 126 “Information Systems and Technologies”. It is taught in the sixth semester in the amount of 90 hours (3 ECTS credits), in particular: lectures – 32 hours, laboratory classes – 16 hours, independent work – 42 hours. The course includes 1 test. The study of the discipline ends with the test. |
| **Course objectives** | Formation of students' in-depth knowledge of the theory and skills of practical software architecture development for large enterprises, corporations and other business structures of any industry and form of ownership. |
| **Types of classes and control** | Lectures, laboratory works, control works, self-study. The course ends with a final exam |
| **Term** | 6 |

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| **Student workload (credits) / Type of course** | 3 / Optional | **Lectures (hours)** | 32 | **Workshops (hours)** | 16 | **Self-study (hours)** | 42 |

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| **Program** | 121-GC01. Ability to abstract thinking, analysis and synthesis. |

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| **competences** | 121-GC 02. Ability to apply knowledge in practical situations.<br>121-GC 05. Ability to learn and master modern knowledge.<br>121-GC 06. Ability to search, process and analyze information from various sources.<br>121-PC15. Ability to develop architectures, modules and components of software systems.<br>122-GC1. Ability to abstract thinking, analysis and synthesis.<br>122-GC2. Ability to apply knowledge in practical situations.<br>122-GC3. Knowledge and understanding of the subject area and understanding of professional activity.<br>122-GC6. Ability to learn and master modern knowledge.<br>122-GC9. Ability to work in team.<br>122-PC8. Ability to design and develop software using different programming paradigms: generalized, object-oriented, functional, logical, with appropriate models, methods and algorithms of calculations, data structures and management mechanisms.<br>122-PC9. Ability to implement a multi-tier computing model based on the client-server architecture, including databases, knowledge bases, and data warehouses, perform distributed processing of large data sets on clusters of standard servers to meet the computing needs of users, including cloud services.<br>122-PC10. Ability to apply methodologies, technologies, and tools to manage the life cycle processes of information and software systems, information technology products and services according to customer requirements.<br>122-PC12. Ability to ensure the organization of computational processes in information systems of various purposes, taking into account the architecture, configuration, performance indicators of operating systems and system software.<br>122-PC19. Ability to comprehensively use for the creation of intelligent management systems methods of mathematical modelling and analysis of complex systems, methods of modelling and analysis of business processes, information technologies for the management of business systems.<br>122-PC20. Ability to develop the architecture of software systems and their particular components during the design of intelligent management systems in various fields, to manage the life cycle of intelligent management systems software.<br>126-GC 1. Ability to abstract thinking, analysis and synthesis.<br>126-GC 2. Ability to apply knowledge in practical situations.<br>126-GC 3. Ability to understand the subject area and professional activity.<br>126-GC 5. Ability to learn and master modern knowledge.<br>126-GC 6. Ability to search, process and summarize information from various sources.<br>126-GC 7. Ability to develop and manage projects.<br>126-PC 1. Ability to analyze the object of design or operation and its subject area. |

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| | 126-PC 2. Ability to apply standards in the field of information systems and technologies in the development of functional profiles, construction and integration of systems, products, services and infrastructure elements of the organization.<br>126-PC 3. Ability to design, develop, debug and improve system, communication and software and hardware of information systems and technologies, the Internet of Things (IoT), computer-integrated systems and system network structure, their management.<br>126-PC 4. Ability to design, develop and use tools for the implementation of information systems, technologies and infocommunications (methodological, informational, algorithmic, technical, software and others).<br>126-PC 6. Ability to use modern information systems and technologies (production, decision support, data mining, etc.), cybersecurit techniques and techniques in the performance of functional tasks and responsibilities.<br>126-PC 10. Ability to apply methodologies, technologies, and tools to manage the life cycle processes of information and software systems, information technology products and services according to customer requirements.<br>126-PC 12. Ability to manage and use modern information and communication systems and technologies (including those based on the use of the Internet). |

| Learning outcomes | Teaching and learning methods | Forms of assessment (continuous assessment CAS, final assessment FAS) |
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| 121-PO07. Know and apply in practice the fundamental concepts, paradigms and basic principles of operation of language, tools and computing software engineering. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, method of feedback from students, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 121- PO18. Know and be able to apply information technology processing, storage and transmission of data. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, project training | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 122-PLO9. Develop software models of subject areas, choose a programming paradigm from the | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual |

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| standpoint of convenience and quality of its application to implement methods and algorithms that solve problems in the computer science field. | problem-based learning | assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 122-PLO10. Use tools for developing client-server applications, design conceptual, logical, and physical models of databases, develop and optimize database queries, create distributed databases, repositories and showcases of databases, and knowledge bases, including those based on cloud services, using web programming languages. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 122-PLO11. Have the skills to manage the life cycle of software, products, and services of information technology under the requirements and restrictions of the customer, be able to develop project documentation (feasibility study, technical task, business plan, agreement, contract). | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 122-PLO19. Create intelligent management systems using methods of mathematical modelling and analysis of complex systems, methods of modelling and analysis of business processes, information technologies for the management of business systems. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 122-PLO20. Develop the architecture of software systems | Interactive lectures with presentations, discussions, | Written individual assignments for laboratory work (CAS), assessment of |

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| and their particular components during the construction of intelligent management systems in various fields, as well as manage the life cycle of intelligent management systems software. | practical classes, teamwork, case method, research, problem-based learning | knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 126-PLO 3. To use basic knowledge of informatics and modern information systems and technologies, programming skills, technologies of safe work in computer networks, methods of creation of databases and Internet resources, technologies of development of algorithms and computer programs in high-level languages with application of project-oriented programming to solve problems of design and use of information systems and technologies. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 126-PLO 4. Conduct a systematic analysis of design objects and justify the choice of structure, algorithms and methods of information transfer in information systems and technologies. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 126-PLO 5. Argue the choice of software and hardware for the creation of information systems and technologies based on the analysis of their properties, purpose and technical characteristics, taking into account the requirements for the system and operating conditions; have the skills to debug and test software and hardware of | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |

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| information systems and technologies. | | |
| 126-PLO 6. Demonstrate knowledge of the current level of information systems technology, practical skills of programming and use of applied and specialized computer systems and environments for their implementation in professional activities. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |
| 126-PLO 7. Justify the choice of technical structure and develop appropriate software that is part of information systems and technologies. | Interactive lectures with presentations, discussions, practical classes, teamwork, case method, research, problem-based learning | Written individual assignments for laboratory work (CAS), assessment of knowledge in laboratory classes (CAS), collection of data on individual assignments and reporting on research results (CAS), final / semester control in the form of a semester exam, according to the learning process schedule (FAS) |

## ASSESSMENT AND GRADING

**Ranges of points corresponding to grades**

| Total score (points) for all types of learning activities | ECTS grading scale | The national grading scale |
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| 90-100 | A | excellent |
| 82-89 | B | good |
| 74-81 | C | |
| 64-73 | D | satisfactory |
| 60-63 | | |
| 35-59 | FX | Unsatisfactory (with the exam retake option) |
| 0-34 | F | Unsatisfactory (with mandatory repetition of the course) |

**Allocation of grade points**

100% **final assessment** in the form of test (30%) and current assessment (70%).

70% **continuous assessment**:

- 45% assessment of tasks in laboratory work (15% for each work);
- 25% intermediate control (control tasks and individual tasks)

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| **Course policy** | Follow the rules of the University internal regulations. Take an active part in the learning process. Students must attend all classes according to the study schedule and adhere to the norms of academic ethics. To study the course, students need to have their personal computer and (or) use computers of the computer center at the department. Students must work with compulsory and recommended reading, including Internet resources. Students must complete and submit all |

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| | laboratory works during the semester in which the course is taught, before the examination session. The final assessment is not carried out without the personal presence of students. |

## COURSE STRUCTURE AND CONTENT

**Semester 1**

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| **Topic 1** | Basic concepts of corporate information systems architecture | **Laboratory work** 1 | Deployment of microservice architecture in AWS | **Self-Study** | Cloud infrastructure deployment models |
| **Topic 2** | Models of providing programs to consumers | **Laboratory work** 2 | Using Firebase in corporate information systems | | Features of JSON Schema |
| **Topic 3** | The role of data exchange formats in corporate information systems | **Laboratory work** 3 | Using JSON to exchange data between services | | |
| **Topic 4** | Features of client-server architecture in corporate information systems | | | | |
| **Topic 5** | Data transmission security in corporate information systems | | | | |

**RECOMMENDED READING**

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| **Compulsory** | 1. Richards, M., Ford, N. (2020). Fundamentals of Software Architecture: An Engineering Approach. O'Reilly Media, 432 p.<br>2. Newman, S. (2021). Building Microservices: Designing Fine-Grained Systems 2nd Edition. O'Reilly Media, 616 p.<br>3. Duggan, D. (2012). Enterprise Software Architecture and Design: Entities, Services, and Resources. Wiley-IEEE Computer Society Pr, 821 p.<br>4. Blokdyk, G. (2011). Client Server Complete Self-Assessment Guide. 5STARCooks, 311 p. | **Recommended** | 5. Pal, R., Pal, N. (2021). Client Server Architecture Reeta, 14 p.<br>6. Newman, S. (2019). Monolith to Microservices: Evolutionary Patterns to Transform Your Monolith 1st Edition. O'Reilly Media, 272 p.<br>7. Hohpe, G. (2020). The Software Architect Elevator: Redefining the Architect's Role in the Digital Enterprise 1st Edition. O'Reilly Media, 368 p.<br>8. Introducing JSON [Electronic resource]. Access mode : https://www.json.org/json-en.html |

## ACADEMIC INTEGRITY

Students are expected to adhere to the Code of Ethics of Academic Relations and Integrity of NTU “KhPI”.

The content of this syllabus is consistent with the course program.