Syllabus
Course Program

Architecture of Corporate Information Systems

Specialty
121 – Software Engineering
122 – Computer Science

Institute
Institute of Computer Science and Information Technology

Educational program
Software Engineering
Computer Science and Intelligent Systems

Department
Software Engineering and Management Intelligent Technologies (321)

Level of education
Bachelor's level

Course type
Special (professional), Elective

Semester
6

Language of instruction
English, Ukrainian

Lecturers and course developers

Ivan Perepelytsya

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PhD, Candidate of Engineering Sciences, Associate Professor of Department of Software Engineering and Management Intelligent Technology of NTU "KhPI". Has more than 15 years of experience in IT companies, and since 2017 has been a technical lead, CTO, COO, at Academy Smart Ltd, Kharkiv, Ukraine.

Leading lecturer of the courses: Architecture of corporate information systems (Bachelors) (Ukrainian, English)
More about the lecturer on the department's website

General information

Summary

The course "Architecture of Corporate Information Systems" completes the cycle of courses on the development, implementation and support of corporate information systems. Students will gain an understanding of architectural concepts and integration of cloud solutions, which will help them become competent specialists in the development and implementation of information systems for modern business.
The course is taught by a practitioner, which determines the practical orientation of the discipline and the use of the experience of real projects of Academy Smart IT company.

Course objectives and goals

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.

Format of classes

Lectures, laboratory works, control works, self-study. The course ends with a final exam.

Competencies

121 - Software Engineering
K01. Ability to abstract thinking, analysis and synthesis.

K02. Ability to apply knowledge in practical situations.
K05. Ability to learn and master modern knowledge.
K06. Ability to search, process and analyze information from various sources.
K15. Ability to develop architectures, modules and components of software systems.
122 - Computer Science and Intelligent Systems
GC1. Ability to abstract thinking, analysis and synthesis.
GC2. Ability to apply knowledge in practical situations.
GC3. Knowledge and understanding of the subject area and understanding of professional activity.
GC6. Ability to learn and master modern knowledge.
GC9. Ability to work in team.
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.
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.
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.
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.
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.
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.

Learning outcomes

121 - Software Engineering
PLO07. Know and apply in practice the fundamental concepts, paradigms and basic principles of operation of language, tools and computing software engineering.
PLO18. Know and be able to apply information technology processing, storage and transmission of data.
122 - Computer Science and Intelligent Systems
PLO9. Develop software models of subject areas, choose a programming paradigm from the standpoint of convenience and quality of its application to implement methods and algorithms that solve problems in the computer science field.
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.
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).
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.
PLO20. Develop the architecture of software systems 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.

Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures - 32 hours, laboratory classes - 16 hours, self-study - 72 hours.

Course prerequisites

Databases for corporate information systems

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

Teaching and learning methods:
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 exam, according to the schedule of the educational process (FAS).

Program of the course

Topics of the lectures

Topic 1. Basic concepts of corporate information systems architecture
Topic 2. Models of providing programs to consumers
Topic 3. The role of data exchange formats in corporate information systems
Topic 4. Features of client-server architecture in corporate information systems
Topic 5. Data transmission security in corporate information systems

Topics of the workshops

Workshops are not provided within the discipline.

Topics of the laboratory classes

Topic 1. Deployment of microservice architecture in AWS
Topic 2. Using Firebase in corporate information systems
Topic 3. Using JSON to exchange data between services

Self-study

Individual assignments are not provided in the curriculum.
Students are recommended with additional materials (videos, articles) for self-study and processing.
- Cloud infrastructure deployment models
- Features of JSON Schema

Course materials and recommended reading

Key literature

1. Richards, M., Ford, N. (2020). Fundamentals of Software Architecture: An Engineering Approach. O'Reilly Media, 432 p.
2. Newman, S. (2021). Building Microservices: Designing Fine-Grained Systems 2nd Edition. O'Reilly Media, 616 p.
3. Duggan, D. (2012). Enterprise Software Architecture and Design: Entities, Services, and Resources. Wiley-IEEE Computer Society Pr, 821 p.
4. Blokdyk, G. (2011). Client Server Complete Self-Assessment Guide. 5STARCooks, 311 p.

Additional literature

5. Pal, R., Pal, N. (2021). Client Server Architecture Reeta, 14 p.
6. Newman, S. (2019). Monolith to Microservices: Evolutionary Patterns to Transform Your Monolith 1st Edition. O'Reilly Media, 272 p.
7. Hohpe, G. (2020). The Software Architect Elevator: Redefining the Architect's Role in the Digital Enterprise 1st Edition. O'Reilly Media, 368 p.
8. Introducing JSON [Electronic resource]. Access mode : https://www.json.org/json-en.html

Assessment and grading

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

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).

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 Guarantors of the educational programs
Andrii KOPP
Uliya LITVINOVA