Syllabus
Course Program

Programming for corporate networks

Specialty
123 – Computer engineering

Institute
Institute of Computer Science and Information Technology

Educational program
Modern programming, mobile devices, and computer games

Department
Computer Engineering and Programming (326)

Level of education
Bachelor's level
Master's level
Ph.D.

Course type
Professional, Elective

Semester
1

Language of instruction
English, Ukrainian

Lecturers and course developers

HEORHII HRIANYK

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For more information about the professor, please visit the department's website.
https://web.kpi.kharkov.ua/cep/2023/08/31/gryanyk-georgij-volodymyrovych/

General information

Summary

Corporate network programming is a specialized field within computer science and information technology that concentrates on creating software solutions tailored for networks..

Course objectives and goals

The purpose of this course is to develop students' holistic knowledge of the peculiarities of programming network applications to be used in corporate networks;.

Format of classes

The course includes lectures, laboratory and practical work, independent study, and consultations. The final assessment is conducted through an exam..

Competencies

CK4: Ability to construct and analyze models of computer systems and networks.
CK10: Ability to identify, classify, and describe the operation of software and technical tools, computer systems, networks, and their components.
CK11: Ability to select effective methods for solving complex problems in computer engineering, critically evaluate obtained results, and justify the decisions made.

Learning outcomes

RN2: Ability to find necessary data, analyze and evaluate them.
RN3: Ability to construct and investigate models of computer systems and networks, evaluate their adequacy, and determine the limits of applicability.

Student workload

The total volume of the course is 150 hours (5 ECTS credits): lectures - 32 hours, practical classes - 16 hours, laboratory classes - 16 hours, self-study - 86 hours.

Course prerequisites

For successful completion of the course you must have knowledge of building and configuring computer networks.

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

Lectures are conducted with the use of multimedia technologies, work with the Windows Server operating system. Programming and configuring local area networks on a personal computer

Program of the course

Topics of the lectures

Topic 1. Organizational and methodological guidelines for studying the course. Ideology of network programming. The structure of network software..
Topic 2. Principles of network software interaction. The concept of distributed data processing in network operating systems. Models of network services: two-link and three-link schemes
Topic 3. Windows network operating systems: characteristics, features, network architecture. The concept of distributed data processing in network operating systems. Workgroups and domains.
Topic 4. Programmatic control of data access levels in corporate networks. Security levels. Rights and privileges. Security Accounts Manager database. Principles of ACL creation and functioning.
Topic 5. Programming basic functions of user budget management.
Topic 6. IP network protocols. Data flows passing through the TCP/IP stack. Ports and protocols of the TCP/IP stack. Port scanning mechanisms.
Topic 7. Features of working with the TCP/IP stack in Windows networking operating systems. Algorithms and software implementation of the remote data management function in corporate networks with Windows OS.
Topic 8. Network programming by means of session and representative levels.
Topic 9. Network features of the OS - clones of *nix.
Network aspects of Ubuntu OS: characteristics, principles of construction. File system ufs: physical organization and addressing of files.
Topic 10. Socket mechanism for Ubuntu OS.
Algorithms for server applications. Algorithms for client applications. Advanced features of the socket mechanism management. Server applications.
Topic 11. Mechanisms for creating distributed applications for Ubuntu OS.

Topics of the workshops

Topic 1. Features of using Microsoft Active Directory in the administration of corporate networks
Topic 2. Programmatic management of local networks through group security policies.
Topic 3. Ports and protocols of the TCP/IP stack. Port scanning mechanisms.
Topic 4. Algorithms and software implementation of port filtering and scanning.
Topic 5. Redirector. Named channels and mailboxes.
Topic 6. Rights on the example of network software for organizing a voice/video conference in Windows
Topic 7. Rights on the example of network software for organizing a voice/video conference in *nix.
Topic 8. Remote procedure call (RPC) and remote monitoring (RMON) tools.

Topics of the laboratory classes

Topic 1. Network connection and listing functions..
Topic 2. Examine network ports in the Windows networking OS.
Topic 3. Protocol analyzers

Topic 4. Client-server applications on local area networks with parallel customer service.
Topic 5. Client-server applications on local networks with freebsd
Topic 6. Client-server applications on local networks with freebsd

Self-study

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Course materials and recommended reading

Primary literature:
1 Tanenbaum E. Modern operating systems / E. Tanenbaum - M.: Peter, 2019. - 1120 c.
2 Computer networks. Principles, technologies, protocols. Textbook for universities. Fifth edition / V.G. Olifer, N.A. Olifer - St. Petersburg: Piter, 2019. - 992 c.
3 Oland J. Programming in Microsoft Windows networks / J. Oland - M.: Piter, 2018. -608c.

Additional literature:
4 Hogdal, S.J. Analysis and diagnostics of computer networks / S.J. Hogdal- M.: Lori, 2017. - 364 c.
5 Winkle L.V. Hands-On Network Programming with C: Learn socket programming in C and write secure and optimized network code / L. V. Winkle - Birmingham: Packt Publishing, 2019. - 478p.
6 V.G. Fedoruk Network programming in UNIX OS - M: MSTU, 2014. - 240 c.
7 Sh. Walton Creating network applications in Linux environment. Developer's Guide - M.: Izd. Dom "Williams", 2011. - 464 c.
8 D. Kamer, D. Stevens TCP/IP Networks. Developing client/server applications for Linux/POSIX - M. : Williams Publishing

Assessment and grading

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

The final grade consists of the assessment results in the form of an exam (40%) and ongoing assessment (60%). Exam: written assignment (2 theory questions + problem-solving) and an oral presentation. Ongoing assessment: 2 online tests (15%), laboratory works (35%), and a computational assignment (10%).

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	Head of the department Oleksandr ZAKOVOROTNYI
	Date, signature	Guarantor of the educational program Heorhii HRIANYK