Syllabus

Course Program

COMPUTER NETWORKS

Specialty
121 – Software Engineering

Institute
Institute of Computer Science and Information Technology

Educational program
Software Engineering

Department
Software Engineering and Management Intelligent Technologies (321)

Level of education
Bachelor's level

Course type
Special (professional), Mandatory

Semester
3

Language of instruction
English, Ukrainian

Lecturers and course developers

Shevchenko Serhii Vasylovych

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Candidate of Technical Sciences, Professor of NTU "KhPI", Professor of the Department of Software Engineering and Information Technology Management of NTU "KhPI". Experience of pedagogical work - 35 years.

Author of about 120 scientific and educational works, (https://www.scopus.com/feedback/author/reviewAuthorProfile.uri?authorIds=57210817349; https://orcid.org/*0000-0002-3831-5425*).

Leading lecturer in the following disciplines: " Fundamentals of Computer Networks", "Computer Networks", "Cloud Computing".
General information, number of publications, main courses, etc.
More about the lecturer on the department's website

General information

Summary

The course "Computer networks" is an educational discipline from the cycle of special mandatory training in specialty 121 "Software engineering". It is in the third semester with lectures, laboratory classes and independent work taught. There are no individual tasks. The study of the discipline ends with a test.

Course objectives and goals

Formation in students of the necessary theoretical knowledge and practical skills of building computer networks with an analysis of their current state, the principles of building distributed information processing systems based on the organization and use of data transmission subsystems to ensure qualitative and quantitative characteristics of high-performance work of distributed information systems of various purposes, their functioning and development forecasting

Format of classes

Lectures, laboratory classes, consultations, self-study. Final control in the form of an test.

Competencies

К01. Ability to think abstractly, analyze and synthesize.
К05. Ability to learn and master modern knowledge.
К06. Ability to search, process and analyze information from various sources.
К15. Ability to develop architectures, modules and components of software systems.
К20. Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.
К26. Ability to think algorithmically and logically.

Learning outcomes

PLO01. Analyze, purposefully search and select information and reference resources and knowledge necessary for solving professional problems, taking into account modern achievements of science and technology.
PLO07. To know and apply in practice the fundamental concepts, paradigms and basic principles of functioning of language, tools and computing tools of software engineering.

Student workload

The total volume of the course is 90 hours (3 ECTS credits): lectures - 16 hours, laboratory classes - 32 hours, self-study - 42 hours.

Course prerequisites

Fundamentals of software engineering.
Computer architecture and operating systems.

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

Lectures, laboratory classes, self-study, consultations. Final control in the form of an test.

Program of the course

Topics of the lectures

Topic 1. Construction principles and components of computer networks
Main characteristics. Network processing efficiency. Performance evaluation criteria.
Topic 2. Management organization
Data processing processes in the network. Independence of management tasks of different levels. Interaction of processes. Message. Ports. Addressing in computer networks
Topic 3. OSI open systems interaction model
Management processes in computer networks. Objects of computer network management. Protocols and their families.
Topic 4. Routing in computer networks
Routing conditions. Routing criteria. Classification of routing algorithms
Topic 5. Flow management
Management levels. Authenticity management and integrity control of information transmitted over the network. Mechanism of receipts and control of request execution time.
Topic 6. Local networks.
Peculiarities of management organization. Topologies and equipment. Network adapters. Protocols of local computer networks.
Topic 7. Internet network.
Construction principles and characteristics. Addressing. Classes of IP addresses. Protocols. Subnets.
Topic 8. WWW network and web technologies.
Functionality. Application level protocols. Development prospects

Topics of the workshops

Practical classes within the discipline are not provided.

Topics of the laboratory classes

Topic 1. Analysis of the network environment of the computer
Topic 2. Analysis of the functional modeling environment for the construction of virtual local networks
Topic 3. Modeling of unification of remote nodes on the basis of concentrators of local computer networks
Topic 4. Modeling the structuring of local computer networks using switches.
Topic 5. Modeling of routers and application of static routing in local computer networks
Topic 6. Analysis of procedures for determining the local address of network nodes
Topic 7. Modeling the structuring of local computer networks using switches
Topic 8. Modeling the construction of arbitrary local computer networks using different classes of IP addresses

Self-study

The curriculum does not provide for individual tasks.
Students are recommended additional materials (videos, articles) for independent study and processing..

Course materials and recommended reading

Basic literature

1. Andrew S. Tanenbaum, Nick Feamster, and David Wetherall. Computer Networks, 6th Edition – Pearson, 2020. - 922 p.
2. Doug Lowe. Networking All-in-One For Dummies, 8th Edition – John Wiley & Sons, 2021. - 1023 p.
3. Царьов Р.Ю. Структуровані кабельні системи: навч. посіб. для студентів вищих навчальних закладів / Царьов Р.Ю., Нікітюк Л.А., Резніченко П.І. – Одеса: ОНАЗ ім. О.С. Попова, 2013. – 260 с.
4. James W. Kurose, Keith W. Ross. Computer Networking: A Top-Down Approach, 9th Edition – Pearson, 2021. - 775 p.
5. Adele Kuzmiakova. Computer Networks and Communications - Arcler Press, 2021. - 268 p.
6. Технологія Ethernet : лабораторний практикум / М.О. Білова, С.П. Євсеєв, О.С. Жученко, І.С. Іванченко, О.В. Шматко. – Харків: НТУ «ХПІ», 2019. – 194 с.
7. Olifer V. Computer Networks: Principles, Technologies and Protocols for Network Design. - Wiley, 2006. - 973 c.

Additional literature

1. Gerry Howser. Computer Networks And The Internet: A Hands-On Approach – Springer, 2020. - 539 p.
2. IEEE Standard for Information Technology — Telecommunications and Information Exchange between Systems Local and Metropolitan Area Networks — Specific Requirements. Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. - The Institute of Electrical and Electronics Engineers, 2020.
3. Crystal Panek. Networking Fundamentals - Sibex/John Wiley & Sons, 2020. – 318 p.
4. Адміністрування комп'ютерних мереж та операційних систем: методичне видання для студентів за спеціальністю 121 «Інженерія програмного забезпечення» факультету інформаційних технологій УжНУ / Розробник: к.т.н., доц. Поліщук В.В. – Ужгород: 2019. – 60 с.
5. Корольов А.В., Кучук Г.А., Пашнєв А.А. Адаптивна маршрутизація в корпоративних мережах. - Х.: ХВУ, 2003. – 224 с.
6. Кучук Г.А., Гахов Р.П., Пашнєв А.А. Управління ресурсами інфотелекомунікацій. - М .: Фізматліт, 2006. – 219 с.
7. Mahmoud Elkhodr, Qusay F. Hassan, Seyed Shahrestani. Networks of the Future: Architectures, Technologies, and Implementations, 1th Edition – Chapman and Hall/CRC, 2018. - 512 p.
8. Network Analysis Using Wireshark 2 Cookbook: Practical recipes to analyze and secure your network using Wireshark 2, 2nd Edition — Paperback, 2018. – 614 p.

Assessment and grading

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

100% final assessment in the form of credit (30%) and current assessment (70%). 30% credit 70% current assessment:
Module №1 (10%)
Module №2 (20%):
1- 8 laboratory works (40%);

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	Guarantor of the educational program Uliya LITVINOVA