



Syllabus

Course Program

Designing computer system and network diagnostics programs

Specialty

123 – Computer Engineering

Institute

Institute of Computer Modeling, Applied Physics and Mathematics

Educational program

Computer science. Modeling, design, and computer graphics

Department

Computer Engineering and Programming)

Level of education

Modern Programming, Mobile Devices and Computer Games

Course type

Professional – Selective

Semester

2

Language of instruction

English, Ukrainian

Lecturers and course developers

Glavchev Maxim Igorevich

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PhD in Economics, Associate Professor, Professor of the Department of Computer Engineering and Programming, NTU "KhPI" He has more than 100 publications. Teaches courses: "Specialized Computer Systems", "Design of Programs for Diagnostics of Computer Systems and Networks", "Hardware Means of Information Security", "Software Means of Information Security". More information about the teacher on the website of the Department of <https://web.kpi.kharkov.ua/cep/2021/09/03/glavchev-maksym-igorovych>

First name and surname

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Academic degree, academic title, position

General information, number of publications, main courses, etc.

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

General information

Summary

Designing programs for diagnosing computer systems and networks is the process of creating software that is designed to identify and solve problems related to computer systems and networks. These programs assist technical support engineers, system administrators, and users in installing and troubleshooting and monitoring and analyzing the performance of computer systems and networks.

Course objectives and goals

The purpose of studying the discipline is to provide theoretical and practical training necessary for students to obtain basic information about modern technologies for obtaining the characteristics of

computer systems and networks, as well as their diagnostics, to gain knowledge and skills in the practical use of diagnostic methods and algorithms, to give knowledge about the features of designing software for diagnostics of CS and networks, the principles of building complexes of diagnostic programs, methods and means of control and testing of individual components and the diagnostic system as a whole, as well as for the study of a number of subsequent disciplines and the implementation of diploma projecting.

Format of classes

Lectures, laboratory and practical work, independent work, consultations. The final control is a differential test.

Competencies

SK1. Ability to determine technical characteristics, design features, application and operation of software, software and hardware, computer systems and networks for various purposes.

SK4. Ability to build and research models of computer systems and networks.

SK8. Ability to ensure the quality of information technology products and services throughout their life cycle.

SK10. Ability to identify, classify, and describe the operation of software and hardware, computer systems, networks, and their components.

Learning outcomes

PH2. Find the necessary data, analyze and evaluate it.

PH3. Build and study models of computer systems and networks, assess their adequacy, determine the limits of applicability.

PH8. Apply knowledge of technical characteristics, design features, purpose and rules of operation of software and hardware of computer systems and networks to solve complex problems of computer engineering and related problems.

Student workload

The total amount of the discipline is 120 (4 ECTS credits): lectures – 32 hours, practical work – 16 hours, laboratory work – 16 hours, individual work – 56 hours.

Course prerequisites

To successfully complete the course, you need to know: programming, system programming, computer architecture, system software, software engineering, computer networks, computer systems.

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

Lectures are held using multimedia technologies, including the interactive cloud environment Microsoft Teams.

Program of the course

Topics of the lectures

Topic 1. General aspects of diagnosis

Goals and objectives of the course. Design of technical diagnostics systems. Methods of test design of computer systems.

Technical diagnostics. Theoretical Basis, Diagnosing Digital and Computer Systems.

Diagnostics of computer and technological systems. Basic concepts. Diagnostic objects. Organization of diagnostic processes. Block diagrams and diagnostic algorithms

Architecture of the PC and its components as an object of diagnostics

Topic 2. Diagnostics of computer equipment

Basic PC diagnostics. Physical diagnostics of computer components. Computer diagnostic programs.

Testing computer components.

Algorithm for collecting information about a PC.

Motherboard diagnostics. Performance diagnostics. Fault finding algorithms.
 Basic I/O system. BIOS components. Пporpama POST.
 Processors. Structure of microprocessor systems. Microcontrollers. Diagnostics of microprocessor systems.
 Storage devices. Internal memory - RAM and ROM. RAM malfunctions. Organization of internal memory diagnostics
 External PC storage. Connection interfaces. Organization of test diagnostics of external memory.
 Characteristics of HDD. Types of file systems and troubleshooting them. Malfunctions of HDD, the nature of the manifestation, the algorithm of elimination. SMART - Smart Technology Standard
 Diagnostics of SSD drives.
 Flash diagnostics and maintenance
 Diagnostics of DVD, CD Blu-ray drives
 Laptop, diagnostic features. Power Controller Diagnostics.
 PC power supply. Diagnostic methods.
 Mobile devices. Algorithm for diagnosing and repairing tablets
Topic 3. Diagnostics of peripheral equipment, computer networks and software.
 I/O devices and their malfunctions. Motherboard ports. Testing the PC's internal controllers. Diagnosing input, sound, modem.
 Diagnostics of the video card. Characteristics, malfunctions, the procedure for their determination.
 Diagnostics of video recording boards.
 Video monitors. Characteristics, diagram for troubleshooting and diagnostics.
 Printers. Methodology for identifying faulty components. Diagnostics of printer print quality.
Topic 4. Diagnostics of computer networks.
 Computer networks. Organization and problems. Diagnostic approaches. Modem organization.
 Global Network. Physical and software organization. Features of diagnostics and safety. Information resources and their use.
 Diagnostics of computer networks. Diagnostic tools, ICMP, DNS service, information retrieval systems.
 Organization of the diagnostic process. Diagnostics of local networks, special tools.
 Diagnostics of wide area networks. IP configuration. Retrieving information about a network device. The network is at a low level.
 Design of network diagnostics utilities.
Topic 5. Software diagnostics.
 Operating environment. Architecture, features and applications.
 Windows diagnostics. Downloads, diagnostic tools, system registry, conflicts, resource usage.
 Linux diagnostics. Terminal problems, file system, boot
 Organization of testing of components and software complexes. Standards, requirements for design and manufacture, reuse, acceptable risks. Test Type Standards and Changes in Design Requirements
 Diagnostics and testing of modules, components and software complexes. Diagnostic Planning, Tools, Configuration Management, and Certification

Topics of the workshops

Topic 1. Testing a PC with AIDA64.
Topic 2. Testing a PC with Sisoftware Sandra
Topic 3. CPU and RAM hardware performance testing.
Topic 4. Hard Drive Testing Programs.
Topic 5. Use of existing software to obtain the characteristics of video cards and their diagnostics.
Topic 6. A study of the use of network commands for system and network administration operations in Windows.
Topic 7. Analysis and identification of information traffic of various network services.
Topic 8. Development of technical specifications for software diagnostics.

Topics of the laboratory classes

Topic 1. Determination of Quantitative Characteristics of Reliability by Statistical Data on Failures of Computer System Elements
Topic 2. Development of programs for diagnosing PC parameters.
Topic 3. Diagnostics of RAM. Noise-tolerant coding. Heming Codes.

- Topic 4. Working with USB devices.
 Topic 5. Diagnose Bluetooth devices.
 Topic 6. Design of network diagnostics utilities.
 Topic 7. Diagnostics of the operating environment.
 Topic 8. Diagnostics of software components and complexes

Self-study

The course provides preparation for practical classes and laboratory work, the result is a report drawn up in the appropriate form.

Students are also recommended additional materials (videos, articles, textbooks) for self-study and analysis

Course materials and recommended reading

References

1. Главчев М.І. Електронний макет конспекту лекційного матеріалу.
https://drive.google.com/drive/folders/1ngixxdhoNcdx-AJX8TEM2Wbem64LfB5D?usp=share_link
2. Главчев М.І. Електронний практикум з лабораторних робіт.
https://drive.google.com/drive/folders/1qReVmukHmJZLbIxUW-kJOgTQjzKWhmu0?usp=share_link
3. Главчев М.І. Електронний практикум з практичних занять.
https://drive.google.com/drive/folders/1eRZ4Z5pp7s3JgAgd1p1M5tBuARda6SQQ?usp=share_link
4. І.А.Жуков, В.І.Дрововозов, Б.Г.Масловський. Експлуатація комп'ютерних систем та мереж. Навчальний посібник. — К: Видавництво Київ, НАУ, 2007. — 368 с.
5. Методичні вказівки до виконання лабораторних робіт з навчальної дисципліни «Контроль та діагностика комп'ютерних систем» для студентів денної та заочної форм навчання за спеціальністю «Комп'ютерна інженерія» / уклад.: Носков В.І., Панченко В.І., Гейко Г.В., Баленко О.І. –Харків: НТУ «ХПІ». – 2019. – 56 с

Further reading:

6. Канер С. и др. Тестирование программного обеспечения / Пер с англ. /Сэм Канер, Джек Фолк, Енг Кек Нгуен. – К.: Издательство, «Диа Софт», 2000. – 544 с.
7. Локазюк В.М.,Савченко Ю.Г. Надійність, контроль, діагностика і модернізація ПК: Посібник.- К.: Видавничий центр " Академія", 2004. – 376 с. (Альма-матер)
8. Николайчук Я.М., Возна Н.Я., Пітух І.Р. Проектування спеціалізованих комп'ютерних систем / Навчальний посібник / - Тернопіль: ТзОВ "Тернограф". 2010. – 392с., іл.

Assessment and grading

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

Description of the final score structure, course requirements, and necessary steps to earn points, especially paying attention to self-study 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

Head of the department
Oleksandr ZAKOVOROTNYI

Date, signature

Guarantor of the educational program
Svitlana GAVRILENKO