



Syllabus Course Program



Fundamentals of information technology in electric power industry

Specialty

141 – Electric Power Engineering, Electrical Engineering and Electromechanics

Institute

Institute of Education and Science in Power Engineering, Electronics and Electromechanics

Educational program

Electrical Power Engineering. Electric Power Stations,
Electrical Power Engineering. Energy Management and Energy-Efficient Technologies

Department

Electric Power Stations (130)

Level of education

Bachelor's level

Course type

Special (professional), Optional

Semester

2

Language of instruction

English, Ukrainian

Lecturers and course developers



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PhD, Senior Research Officer, Professor

Author of more than 90 scientific, educational, and methodological publications. Leading lecturer of the disciplines: "Fundamentals of information technology in electric power industry", "Accounting and management of power consumption", "Energy Policy and Energy Marketing", "Modeling and forecasting of power consumption", "Problems, Technologies, and Prospects of Industry Development".

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

General information

Summary

The "Fundamentals of Information Technology in Electric Power Industry" course is designed to provide students with knowledge and skills related to solving common and engineering tasks on a personal computer using general and specialized applications and programming. The course covers topics such as the architecture of personal computers, operating system, common word and spreadsheet processors, solving mathematical problems using Matlab/Scilab packages, and basics of programming in Matlab/Scilab. Practical tasks of the course are performed using open-source software or Microsoft 365 platform. No special knowledge is required to take this course.

Course objectives and goals

Goal.

Formation of knowledge about methods and techniques for solving specialty problems on a personal computer with the help of specialized programs and programming languages.

Objectives.

To know:

- architecture of personal computer, operating system;
- techniques of working with vector and raster graphic editors;
- techniques of working with text documents and data using common word and spreadsheet processors;
- basics of solving mathematical problems using the Matlab / Scilab packages;
- methods of mathematical problems algorithmization;
- basics of high-level programming language Matlab / Scilab.

To be able to:

- work on a personal computer with special software: word and spreadsheet processors, graphics software, math packages;
- develop and debug high-level programming languages programs to solve applied engineering problems.

Format of classes

Lectures, laboratory works, workshops, consultations, self-study. Coursework. Final control – exam.

Competencies

GC 7. Skills of using information and communication technologies.

GC 9. Ability to search, process and analyze information from various sources

PC 1. Ability to use computer-aided design (CAD), manufacturing (CAM) and engineering calculations (CAE) and related application software packages.

PC 21. Receipt and use of professional knowledge and understanding related to the information protection of power systems with the use of modern information and computer technologies.

Learning outcomes

PRT 1. To find the necessary information in the information space.

PRT 30. To improve the skills of working with modern equipment and software when performing calculations of operating modes of electrical, electrical and electromechanical equipment, corresponding complexes and systems

Student workload

The total volume of the course is 180 hours (6 ECTS credits): lectures - 32 hours, laboratory classes - 32 hours, practical classes (workshops) – 16 hours, self-study - 100 hours.

Course prerequisites

No special knowledge is required for this course.

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

Lectures are conducted interactively using multimedia technologies. At workshops and laboratory classes, the skills of student work formatting, the ability to use the university educational platform and resources are practiced. Practical tasks are performed using open-source software or on the Microsoft 365 platform. Learning materials are available to students through the OneNote Class Notebook.

Program of the course

Topics of the lectures

Content module 1. Personal computer and general-purpose software

Topic 1. Information

The concept of information. Information processes. The main stages and levels of information processing. The concept of information technology.

Topic 2. Binary number system.

Positional number systems. Binary number system. Bits, bytes.

Topic 3. Data representation in a computer

Ways to represent numerical, text, graphic, video and audio information in a computer.

Topic 4. Personal Computer

History of personal computers. PC hardware architecture. CPU device. Memory and storage devices.

Topic 5. PC operating system

The concept of the operating system. The concept of file system. Architecture of WinNT family operating systems. Hardware abstractions level of WinNT. Kernel of WinNT. Executive subsystem of WinNT.

Topic 6. Computer security

Computer security. Development history and common types of malwares. Classification of malicious programs by action. Classification of malicious programs by distribution. Types and principles of antivirus programs.

Topic 7. Word processor

The concept of a word (text) processor. Font formatting parameters. Paragraph formatting parameters. Border and fill formatting parameters. Tab formatting parameters. Using formatting styles. Automatic table of content. Page formatting parameters. Footer formatting parameters. Automatic page numbering. Printing options.

Topic 8. Spreadsheet processor

The concept of spreadsheet. Comparative characteristics of word processors and spreadsheet processors. Sheet and cell. Data and cell formats. Types of links. Formulas. Formula operators. Syntax of Excel / Calc functions. Basic mathematical functions of Excel / Calc. Basic logical functions of Excel/Calc.

Topic 9. Mathematical package Matlab / Scilab

Principles of the Matlab / Scilab mathematical package. Basic commands of the working environment. Basic functions for mathematical calculations with scalar, vector and matrix data. The main functions of graphing. Basics of work in Simulink / Xcos.

Content module 2. Fundamentals of algorithms and programming languages Matlab / Scilab

Topic 10. Algorithm

Algorithm. Algorithm properties. Algorithm recording forms. Stages of program development.

Topic 11. The structure of a program in Pascal. Data

Program structure. Data types. Constants. Variables.

Topic 12. Linear computational process

Linear computational process. Assignment operator. Arithmetic expressions. I/O operators. Examples of simple computing programs.

Topic 13. Branched computational process

Logical expressions. Relationship operations. Logical operations. Conditional operator: short, full. Nested conditional operators. Case operator. Typical algorithms with conditional operator.

Topic 14. Cycles

Cycles with precondition. Cycle with counter. Typical algorithms for function tabulation.

Topic 15. Basic algorithms for data analysis

Typical algorithms for calculating the number, sum and product. Typical algorithms for finding extreme values

Topic 16. Arrays

One-dimensional arrays. Typical algorithms for input, output and processing of one-dimensional arrays. Sorting

Topic 17. Subroutines

Procedures. Functions. Solving of typical problems using subroutines

Topics of the workshops

Topic 1. Binary number system

Topic 2. Microsoft Office. Libre Office. Microsoft 365.

Topic 3. Spreadsheet processor Excel / Calc

Topic 4. Mathematical calculations in the Matlab / Scilab package

Topic 5. Basics of work in the Simulink / Xcos toolbox

Topic 6. Logical expression

Topic 7. Algorithms for calculating the number, sum, mean, root mean square, product, maximum, minimum

Topic 8. Calculating the number, sum, mean, root mean square, product, maximum, minimum for elements of matrix

Topics of the laboratory classes

- Topic 1. PC hardware architecture. Working with the Windows operating system. University network.
- Topic 2. Computer graphics (vector editor)
- Topic 3. Word processor Word / Writer. Part 1
- Topic 4. Word processor Word / Writer. Part 2
- Topic 5. Spreadsheet processor Excel / Calc. Part 1
- Topic 6. Spreadsheet processor Excel / Calc. Part 2
- Topic 7. Mathematical calculations in the Matlab / Scilab package
- Topic 8. Plotting in the Matlab / Scilab package
- Topic 9. Basics of work in the Simulink / Xcos toolbox
- Topic 10. The working environment of program development and debugging Matlab / Scilab. Linear input / output programs
- Topic 11. Algorithms with conditional operator
- Topic 12. Function tabulation.
- Topic 13. Algorithms for calculating the number, sum, mean, root mean square, product, maximum, minimum
- Topic 14. Algorithms for one-dimensional arrays sorting
- Topic 15. Calculating the number, sum, mean, root mean square, product, maximum, minimum for elements of matrix
- Topic 16. Matrix processing using subroutines

Self-study

Topics

- Topic 1. Data representation in a computer
- Topic 2. Word processors
- Topic 3. Spreadsheet processors
- Topic 4. PC operating systems
- Topic 5. Cybersecurity
- Topic 6. Mathematical packages Matlab / Scilab
- Topic 7. Coursework
- Topic 8. Integrated development environment for program development and debugging
- Topic 9. Algorithms for calculating the number, sum, mean, root mean square, product, maximum, minimum
- Topic 10. Efficiency of sorting algorithms
- Topic 11. Matrix processing algorithms
- Topic 12. Procedural programming

Coursework

- Topic "Mathematical calculations in Matlab / Scilab".
- Assignment according to the variant.
- The term of defense of the coursework is the 16th week.

Course materials and recommended reading

Compulsory.

1. Wempen F. Computing Fundamentals. Chichester, England: Wiley, 2014, -752 p.
2. Scilab for very beginners [Electronic resource]. Scilab Enterprises, 2011. - 577 p. – Access: https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
3. Hudson S. EE 221 Numerical Computing for Engineers [Electronic resource]. WSU Tri-Cities, 2017. – Access: <https://users.tricity.wsu.edu/~hudson/Teaching/EE221>

Additional.

1. Silberschatz A., Galvin P. B., Gagne G. Operating system concepts essentials. Wiley Publishing, 2013. – 782 p. – Access: <https://www.os-book.com/>

2. Otto S., Denier J. P. An introduction to programming and numerical methods in MATLAB. Springer Science & Business Medi, 2005, –468. – Access: <https://www.math.unipd.it/~mrrusso/Didattica/NA-Yaounde/Manual.pdf>

Resources on the Internet

1. <http://scilab.org>
2. <http://mathworks.com>
4. <https://cloud.scilab.in>
5. <https://xcos.fossee.in>

Assessment and grading

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

Final score consists of up to:
 30 points for two module tests,
 30 points for laboratory classes and workshops tasks,
 20 points for coursework, and
 20 points for final tests.

Coursework defense is mandatory.

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 LAZURENKO

Date, signature

Guarantor of the educational program
 Oleksandr LAZURENKO