Syllabus
Course Program

Programming of Embedded Systems in C

Specialty
141 – Electric power engineering, electrical engineering and electromechanics

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

Educational program
Electromechanics

Department
Department of Automated Electromechanics Systems (129)

Level of education
Bachelor's level

Course type
Optional

Semester
7

Language of instruction
English,

Lecturers and course developers

Yevhenii Sakun

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PhD, Assistant at Department of Automated Electromechanics Systems of NTU "KhPI"

Author and co-author of more than 9 scientific publications.
Courses: "Embedded control systems in mechatronics", "Programming in the C language", "Вбудовані системи керування в мехатроніці"
More about the lecturer on the department's website

General information

Summary

"Programming of Embedded Systems in C" course was designed to provide students with basic theory and practical skills in software development for embedded systems using the de-facto standard language in the field - the C language.

Course objectives and goals

The course objective is to make students familiar with C language and specifics of software development for embedded systems..

Format of classes

Lectures, self-study. Final control in the form of test.

Competencies

C01. The ability to abstract thinking, analysis and synthesis.
C02. The ability to apply knowledge in practical situations.
C05. The ability to search, process and analyze information from various sources.
C06. The ability to identify, pose and solve problems.
C08. The ability to work autonomously.

C12. The ability to solve practical problems involving the methods of mathematics, physics and electrical engineering.

Learning outcomes

PR03. Know the principles of operation of electrical machines, apparaptus and automated electric drives and be able to use them to solve practical problems in professional activities.
PR07. Carry out the analysis of processes in electric power, electrotechnical and electromechanical equipment, relevant complexes and systems.
PR17. Solve complex specialized problems in the design and maintenance of electromechanical systems, electrical equipment of power stations, substations, systems and networks.

Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures - 48 hours, self-study - 72 hours.

Course prerequisites

To successfully complete the course, a student must have some basic background in electronics, informatics, and programming.

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

Lectures are conducted interactively using multimedia technologies. Individual project is developed using online tools and simulators.

Program of the course

Topics of the lectures

Topic 1. Introduction
Topic 2. Requirements
Topic 3. Data structures
Topic 4 Math
Topic 5. Data conversions. Control flow
Topic 6. Software modules
Topic 7. C preprocessor
Topic 8. Libraries
Topic 9. Error handling
Topic 10. Debugging
Topic 11. Advanced data types
Topic 12. Memory management
Topic 13. Code quality management
Topic 14. Code reliability. Refactoring
Topic 15. Testing

Topics of the workshops

No workshops in this course

Topics of the laboratory classes

No lectures in this course

Self-study

Students complete an individual project following the materials given during the lectures.

Course materials and recommended reading

1. K. N. King C Programming: A Modern Approach. Georgia State University. 2008

2. Samuel Harbison, Guy Steele Jr. C: A Reference Manual. 5th Edition, 2002
3. David Hanson. C Interfaces and Implementations: Techniques for Creating Reusable Software. 1st Edition. 1996
4. P.J. Plauger. Standard C Library. The 1st Edition. 1991
5. Robert Sedgewick. Algorithms in C, Parts 1-4: Fundamentals, Data Structures, Sorting, Searching. 3rd Edition. 1997
6. Jeri R. Hanly, Elliot B. Koffman. Problem Solving and Program Design in C. 6th Edition. 2009
7. Marwedel, Peter. Embedded System Design. Springer Nature. 2021
8. Edward Ashford Lee, Sanjit Arunkumar Seshia. Introduction to Embedded Systems, Second Edition. 2016

Assessment and grading

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

The final grade consists of the results of the evaluation of laboratory reports (60%) and individual project (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	Date, signature 21.09.2023	Head of the department Bohdan VOROBYOV
	Date, signature 21.09.2023	Guarantor of the educational program Mykola ANISHCHENKO