Національний технічний університ
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ І
імені ІГОРЯ СІКОРСЬКОГО»

Емблема кафедри (за наявності)

Кафедра обчислювальної техніки

COMPUTER LOGIC. COURSE WORK

(Syllabus)

1. Details of the academic discipline

Level of higher education	***First (Bachelor's degree)***
Branch of knowledge	*12 Information technology*
Specialty	*123 Computer engineering*
Educational program	*Computer systems and networks*
The status of the discipline	*Normative*
Form of education	*Full-time, part-time*
Year of training, semester	*1 course, fall semester*
Scope of discipline	*1 credit (30 hours - individual work of students)*
Semester control/ control measures	*Credit/defense of course work*
Lessons	
Language of instruction	*English*
Information about the course leader / teachers	Dr. Sci. (Engin.), professor *Zhabin Valerii Ivanovych* viz.kpi@gmail.com *phD, Docent Verba Oleksandr Andriiovych*, olverba@gmail.com
Course placement	http://comsys.kpi.ua

2. Program of educational discipline

1. Description of the educational discipline, its purpose, subject of study and learning outcomes

*The educational discipline "**Computer logic. Course work**" refers to the normative educational components of the educational program, namely to the professional training cycle PO14 of the educational and professional program.*

***Reasons and motivation for studying:** the need for the educational discipline "Coursework in Computer Logic" is to consolidate, deepen, generalize the theoretical knowledge and practical skills that students acquire while studying the discipline "Computer Logic", understanding the principles of building combinational circuits and digital machines.*

***The goal of the educational discipline:** for students to acquire knowledge of the most important sections of the theory of switching functions, applied questions of the theory of digital automata, as well as to acquire skills and abilities in the application of logical methods of analysis and synthesis of digital circuits, to learn to use reference literature and to study the process of creating design and construction documentation in accordance with the current standards.*

***The goal of the educational discipline** is the formation of a number of competencies in students, namely:*

***ABILITY**:*

- *represent switching functions in canonical forms of various algebras;*
- *carry out minimization of switching functions;*
- *to obtain operator forms of switching functions for different elementary bases;*

- *develop combination schemes, evaluate their parameters;*
- *to develop algorithms for the functioning of automata with memory, to make their formalized description;*
- *perform abstract synthesis of automata;*
- *perform structural synthesis of synchronous and asynchronous automata;*
- *also competences ЗК-3, ЗК-7, ФК5-ФК8, ФК-11, ФК-12, ФК14 and program results ПРН3, ПРН7, ПРН13, ПРН16, ПРН15, ПРН22 of the educational and professional program.*

1.2. The main tasks of the academic discipline.

After mastering the academic discipline, students must demonstrate the following learning outcomes:

***KNOWLEDGE**:*

- basic terms and definitions of computer logic;
- basic provisions of the theory of switching functions;
- basic methods of synthesis of digital automata in different elementary bases;
- basic methods of digital circuit analysis;
- methods of comparative analysis of technical solutions;
- principles of construction of typical circuits of computing equipment.

***SKILLS**:*

- represent switching functions in canonical forms of various algebras;
- minimize switching functions;
- obtain operator forms of switching functions for different elementary bases;
- develop combination schemes, evaluate their parameters;
- develop algorithms for the functioning of automata with memory, make their formalized description;
- perform abstract synthesis of automata;
- perform structural synthesis of synchronous and asynchronous automata;
- apply methods of avoiding failures in digital schemes of automata.
- search for optimal solutions when building logical schemes;
- formulation of practical problems in terms of computer logic;
- use of abstract and structural theory of digital automata;
- use for the construction of logic circuits of programmable logic controllers;
- selection of rational options for solving computer logic problems.

2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to the relevant educational program)

*Interdisciplinary connections: In order to successfully study the discipline "**Coursework in Computer Logic"**, students must master the material and have certain knowledge. skills and abilities in such disciplines as:*

- *ЗО10 - "Discrete mathematics",*
- *ЗО11- "Physics",*
- *ПО1 - "Computer logic",*

*The knowledge and skills acquired during the study of the discipline "**Coursework in Computer Logic**" can be used in the future when mastering the following courses:*

- *ПО6 – "Computer Architecture",*
- *ПО11- "Computer systems"*
- *ПО17 – "Coursework on Computer Architecture",*
- *ПО19 - "Computer circuitry",*

as well as during diploma design.

3. Content of the academic discipline

- *The course work is performed according to an individual task and is prepared for defense in the final period of theoretical training. The coursework must be prepared for the defense*

within the term specified in the assignment and agreed with the teacher. For the defense of the coursework, an explanatory note is submitted as follows:

- *title page;*
- *technical task;*
- *content;*
- *introduction;*
- *main part; includes sections*

– digital automaton synthesis;

- construction of a circuit of an electrical functional digital automaton;

– synthesis of combinational schemes;

- *conclusions;*
- *References.*

3.1 Stages of course work

The main stages of course work:

Getting a topic and task
Selection and study of literature
Formation of the technical task
Synthesis of the automaton
Synthesis of combinational circuits
Development of a functional scheme
Issuance of an explanatory note
Submission of a course project (work) for review
Protection of course project (work)

4. Educational materials and resources

4.1. Basic:

1. Computer logic. Course work [Electronic resource]: a study guide for bachelor's degree holders in the educational program "Computer systems and networks" specialty 123 Computer engineering / KPI named after Igor Sikorskyi; edited by: V. I. Zhabin, O. A. Verba. – Electronic text data (1 file: 1.30 MB). – Kyiv: KPI named after Igor Sikorskyi, 2022. – 52 p. The fretboard was provided by the Methodical Council of KPI named after Igor Sikorskyi, protocol No. 1 dated September 2, 2022. https://ela.kpi.ua/handle/123456789/50134

2. Computer logic. Term Paper. Methodical instructions for course work. [Text] / Compilers: V.I. Zhabin, O.A. Willow. - NTUU "KPI named after Igor Sikorsky", 2022, 19 p. . (Approved by the Methodological Council of FIOT, protocol No. 10 dated 09.06.2022). https://campus.kpi.ua/tutor/index.php?mode=mob&show&irid=219299.

3. Zhabin V.I., Zhukov I.A., Klymenko I.A., Tkachenko V.V. Applied theory of digital automata: Study. manual. - K.: Publishing House of NAU, 2009. - 364 p. (Vulture of the Ministry of Education and Culture of Ukraine), https://www.twirpx.com/file/590265/; https://campus.kpi.ua/tutor/index.php?mode=mob&show&file=fkdxxqvhrvxobmrvpahp.

4. Zhabin V.I., Tkachenko V.V. Digital machines. Practicum - K.: VEK+, 2004. - 160 p.

5. Matvienko M.P. Computer logic. Textbook. View. 2nd revision. and additional - Kyiv: Lira Publishing House - K, 2017. - 324 p.

4.2 Auxiliary:

*DSTU GOST 2.001:2006 Unified system of design documentation. General provisions (GOST 2.001-93, IDT)*http://online.budstandart.com/ua/catalog/doc-page?id_doc=55414.

3. *DSTU GOST 2.051:2006 Unified system of design documentation. Electronic documents. General provisions (GOST 2.051-2006, IDT)*
4. *DSTU ISO 5457:2006 (ISO 5457:1999, IDT) National standard of Ukraine. Technical documentation for products. Draftsmen Sizes and formats*
5. *DSTU GOST 2.702:2013 EUSKD. Rules for the execution of electrical circuits (GOST 2.702-2011, IDT)*
6. *DSTU 3008-2015 "State standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and registration rules"*

7. Educational content

4.

5. Methods of mastering an educational discipline (educational component)

8. *The completion of the course work consists of nine stages, which are listed in table 5.1.*

*Table **5.1***

Semester week	The name of the stage of work
3	Getting a topic and task
4-5	Selection and study of literature
6-7	Formation of the technical task
8-10	Synthesis of the automaton
11-13	Synthesis of combinational circuits
14	Development of a functional scheme
15	Issuance of an explanatory note
16	Submission of coursework for review
17	Protection of term paper

6. Individual work

№ з/п	***The name of the topic submitted for independent processing***	***hours***
1	*Obtaining a topic and assignment for a term paper*	*1*
2	*Analysis of the task, selection and study of the literature*	*5*
3	*Execution of the synthesis of the automaton and combinational circuits, the development of the electric functional circuit*	*20*
4	*Drawing up an explanatory note to the term paper*	*4*
	Together:	*30*

9. Policy and control

7. Policy of academic discipline (educational component)

The design of the coursework must meet the requirements for reports on the GDR (DSTU 3008-2015 "State standard of Ukraine. Documentation. Reports in the field of science and technology. Structure and rules of design").

All illustrative material in the course work must be done using computer tools. The content of the illustrative material should sufficiently reflect the main provisions that are being defended.

Both the teacher and the student are obliged to adhere to the Code of Honor of the National Technical University of Ukraine "Kyiv Polytechnic Institute".

The main provisions of the policy:

- the topic of the course work can be coordinated with the topic of the future qualification work of the bachelor;

- the stages of the course work must be completed according to the established calendar schedule of work;

- the developed digital automaton must be tested with the help of the "Program for modeling logic circuits" - AFDK, the results of which (timing diagrams) are given in the text of the main part of the course work;

- in the case of detection of academic dishonesty and plagiarism, the coursework is returned for radical revision with a possible change of topic;

- untimely completion of the stage of the course work entails a reduction of the points received for it by 10% if the delay is no more than two weeks, by 20% if the delay is more than two weeks.

The following factors are taken into account when evaluating course work:

- *complete completion of the individual task for the course work;*
- *correctness and efficiency of the developed schemes;*
- *timeliness of course work according to the schedule;*
- *independent performance of coursework and absence of signs of plagiarism;*
- *answers to questions about the content of the coursework during its defense.*

8. Types of control and rating system for evaluating learning outcomes (RSO)

*The system of evaluating the success of students in the discipline "Coursework in Computer Logic" is based on the "Regulations on the system of evaluating the results of training at KPI named after Igor Sikorskyi", (***https://document.kpi.ua/files/2020_1-273.pdf***) namely, the rating system of evaluation of the second type (RSE-2).*

RSE-2 consists of two components:

- *start (**R_C**);*
- *protection component (**R_3**)*

$$R_K = R_C + R_3$$

The first (initial) component characterizes the student's course work and its result - the quality of the explanatory note and developed schemes. The second component characterizes the quality of the student's defense of the course work.

The size of the scale of the first component equals 80 points, and the second component - ***20 points****.*

The quality of the explanatory note and the degree of compliance with the work schedule

Weight score – ***80*** *(R_C).*

The criteria for evaluating the components of the explanatory note are given in Table 8.1

Table 8.1 – Evaluation criteria for the implementation of the components of the explanatory note

№	*Composite works*	*The maximum number of points for timely performance*	*Taking into account the timeliness of execution*
1	*Layout of the title page*	*2*	***100%** of the grade if the work schedule is followed* ***90%** in case of delay up to 2 weeks* ***80%** in case of a delay of more than 2 weeks*
2	*Availability of a technical task for the KR*	*2*	
3	*Availability and content of the album description*	*2*	
4	*Availability of content*	*2*	
5	*Availability and content of the introduction*	*2*	
6	*Availability and content of automaton synthesis*	*20*	
7	*Availability and content of the electrical functional scheme*	*15*	
8	*The presence and content of the synthesis of combinational schemes*	*20*	
9	*Availability and content of test results (time charts) of the digital automaton*	*5*	
10	*Availability and content of conclusions*	*5*	
11	*Availability and registration of the list of sources*	*5*	
	Total	***80***	

A student is allowed to defend a coursework on the condition that he has an initial R_C component of at least 60% of the maximum value, which is

80 x 0.6 = 48 points.

Quality of protection

*Weight score – **20** (R_3).*

Evaluation criteria for the performance with a report based on the materials of the KP and answers to

question:

– mastery of theoretical material up to 10 points;

– the degree of mastery of methods of synthesis and analysis of schemes in general up to 10 points.

The defense of the coursework is considered successful if the R_3 is at least 60% of its maximum value, i.e.

20 x 0.6 = 12 points.

After the defense of the coursework is completed, the $\boldsymbol{R_K}$ is determined, which is later translated into an assessment on the university scale according to the table:

Points	**Rating**

95-100	Perfectly
85-94	Very well
75-84	Good
65-74	Satisfactorily
60-64	Enough
< 60	Unsatisfactorily
Laboratory work not performed	Not allowed

Working program of the academic discipline (syllabus):

Compiled by: professor of the faculty OT, Doctor of Technical Sciences, Prof. V. I. Zhabin, associate professor of the Department of OT, Ph.D., O. A. Verba.

Approved by the Department of Computing (Protocol No. 10 dated May 25, 2022)

Agreed by the Methodical Commission of the FIOT faculty (protocol No. 10 dated June 9, 2022)