Fundamentals of Informatics

Working program of basic discipline (Silabus)

Requisites for basic discipline

Level of higher education	*First (bachelor's)*
Branch of knowledge	*16 Chemical and Bioengineering*
Specialty	*163 Biomedical Engineering*
Educational program	*Medical Engineering*
Discipline status	*Mandatory discipline*
Form of study	*full-time / day / mixed / remote*
Year of preparation, semester	*1 course (spring semester)*
The scope of discipline	*5.5 ECTS credits / 165 hours*
Semester control / Control measures	*Test Work, Modular Test Work, Calculation and Graphic Work*
Lessons schedule	*According to the schedule on the site http://rozklad.kpi.ua/*
Language of instruction	*English*
Information about course leader / teachers	*__Lecturer:__ Candidate of Physical and Mathematical Sciences, Senior Lecture of BMK Department Vdovychenko Olga Vladimirovna, e-mail – olga.v.vdovychenko@gmail.com, Telegram - https://t.me/Olga_Vdovychenko* *__Practical:__ Candidate of Physical and Mathematical Sciences, Senior Lecture of BMK Department Vdovychenko Olga Vladimirovna, e-mail – olga.v.vdovychenko@gmail.com, Telegram - https://t.me/Olga_Vdovychenko*
Course placement	*Platform «Sikorsky» - course «Medical Microprocessor Systems» (az72wi)*

Curriculum of the discipline

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

The main purpose of the discipline "Fundamentals of Informatics" is the formation of students' ability to widely use the capabilities of the information package of Microsoft Office software in further educational and professional activities; use Python-based programming methods and tools in accordance with the latest principles and trends in creating software products to customize database performance.

General competencies (OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):

GC 1 - Ability to abstract thinking, analysis and synthesis.
GC 4 - Skills in the use of information and communication technologies.
GC 6 - Ability to search, process and analyze information from various sources.
GC 7 - Ability to generate new ideas (creativity).
GC 8 - Ability to make well-grounded decisions.

The program learning outcomes after studying the discipline "Medical Microprocessor Systems" are (OPP was put into effect by the Rector's Order NON/ 89/2021 of 19.04.2021):

PLO 16 - Application of modern programming technologies and tools that support their use.

2. **Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)**

The discipline "Fundamentals of Informatics" belongs to the cycle of professional training and has an interdisciplinary nature. It is the basis for disciplines such as Object Oriented Programming. According to the structural and logical scheme of the training program, the discipline "Fundamentals of Informatics" is closely related to other disciplines of training, such as Mathematical modeling of biomedical systems, Pre-diploma practice and Diploma design and is the basis for further practical work in the specialty.

3. **The content of the discipline**

The main sections and topics that will be considered in the process of studying the course:

Section 1. Basics of Python programming

Topic 1.1. History of computer technology.

Topic 1.2. The concept of algorithm. Algorithmic structures.

Topic 1.3. Introduction to Python programming. Computer arithmetic and synteractive Python.

Topic 1.4. Data types

Topic 1.5. Algorithmic structures in Python. Managing the logical sequence of program execution.

Topic 1.6. Complex data structures: string, list, tuple, dictionary.

Topic 1.7. Procedures and functions and modularity in Python.

Topic 1.8. Files. Exception.

4. **Training materials and resources**

Basic literature:

1. *Лутц М. Изучаем Python, 4-е издание - Пер. с англ. - СПб.: Символ-Плюс, 2011. - 992 с*
2. *Доусон М. Программируем на Python. - СПб.: Питер, 2014. - 416 с.*
3. *Мусин Д. Самоучитель Python. Выпуск 0.2, 2015. - 136 с*

Additional literature:

1. *Дональд Кнут Искусство программирования, том 1. Основные алгоритмы = The Art of Computer Programming, vol.1. Fundamental Algorithms. — 3-е изд. — М.: «Вильямс», 2006. — С. 720. — ISBN 0-201-89683-4*
2. *Методичні рекомендації до виконання комп'ютерних практикумів (поточна версія: http://ela.kpi.ua/handle/123456789/19848).*
3. *Національний Відкритий Університет «ІНТУЇТ» - www.intuit.ru*
4. *Навчально-методична та фахова література для студентів та викладачів технічних, природничонаукових та інших навчальних закладів http://www.twirpx.com/*
5. *Автоматизована інформаційна система «Електронний кампус НТУУ «КПІ» - http://kpi.ua/ecampus*
6. *Навчальна БД: http://witdba.iptcom.net:8080/apex/*

Educational content

5. **Methods of mastering the discipline (educational component)**

№ s/n	Subject	Program learning outcomes	The main tasks	
			Control measure	Deadline
Spring semester, 5.5 ECTS credits / 165 hours				
1.	*Basics of algorithm*	*PLO 16*	*Practical work 1*	*3rd week*
2.	*Work in the IDLE integrated development environment. Data types. The concept of*	*PLO 16*	*Practical work 2*	*4th week*

	variable			
3.	*Branched structure algorithms.*	*PLO 16*	*Practical work 3*	*5th week*
4.	*Programming of loop algorithms*	*PLO 16*	*Practical work 4*	*6th week*
5.	*Sequences: lists.*	*PLO 16*	*Practical work 5*	*7th week*
6.	*Modular control work*	*PLO 16*	*-*	*8th week*
7.	*Programming with one-dimensional arrays*	*PLO 16*	*Practical work 6*	*9th week*
8.	*Programming with one-dimensional arrays*	*PLO 16*	*Practical work 7*	*10th week*
9.	*Building programs using other data structures: strings, tuples, dictionaries*	*PLO 16*	*Practical work 8*	*11th week*
10.	*Functions and Modules*	*PLO 16*	*Practical work 9*	*12th week*
11.	*Files*	*PLO 16*	*Practical work 10*	*13th week*
12.	*Calculation and graphic work*	*PLO 16*	*Registration and submission of work*	*13-14th week*
13.	*Test*		*-*	*14th week*

6. Independent student work

One of the main types of semester control during the mastering of the discipline "Fundamentals of Informatics" is the implementation of calculation and graphic work. Calculation and graphic work is performed in accordance with the requirements, within the period specified by the teacher.

The main purpose of computational and graphic work is to solve a practical problem using the material learned in lectures and independently, and practical skills acquired in practical work. The student can write calculation and graphic work only on the subject agreed with the teacher.

Approximate subject of calculation and graphic work:

1. *Development of the software application "Multifunctional calculator";*
2. *Development of the software application "Calories calculator";*
3. *Development of the software application "Minesweeper".*

The title page of the calculation and graphic work should have the following content: the name of the university; name of the faculty; name of department; name of specialty, name of educational-professional program, name of academic discipline; theme of calculation and graphic work; surname and name of the student, course, number of the academic group, year.

The title page is followed by a detailed plan (content) of the calculation and graphic work, which should highlight the introduction, sections of the main content (main topics studied), their subdivisions (if necessary), conclusion, list of sources used. The table of contents on the right indicates the page numbers at the beginning of each question. Each section begins on a new page.

The total amount of calculation and graphic work, depending on the chosen topic can vary from 25 to 40 pages of the main text (in consultation with the teacher). The amount of computational and graphic work is determined by the student's ability to briefly and at the same time comprehensively explain and analyze the program code in the Code Composer Studio environment.

Mandatory requirement: clear reference to sources of information. All figures, facts, opinions of scientists, quotations, formulas should have a reference in the form [2, p. 54] (the first digit means the

number of the source in the list of references given at the end of the creative work, and the second digit - the page number in this source). It is desirable to use tables, diagrams, graphs, charts, etc. The list of used sources (not less than 10 sources) is made out according to operating rules. If the information is taken from the Internet, you need, as for ordinary literature, specify the author, the title of the article, and then provide the address of the site on the Internet.

Calculation and graphic work is evaluated by the following criteria: logic of the plan; completeness and depth of topic disclosure; reliability of the received data; reflection of practical materials and results of calculations; correctness of formulation of conclusions of the received results and conclusions; design; substantiation of the student's own opinion on this issue in the form of a conclusion.

Deadline for submission of calculation and graphic work for verification: 13-14th week of study.

Calculation and graphic work is not tested for plagiarism, but must meet the requirements of academic integrity. In case of academic dishonesty, the work is canceled and not checked.

Policy and control

7. Policy of academic discipline (educational component)

Attending classes

Attendance at lectures is not mandatory, but it is desirable, because there are no sources that cover the systematized educational material in sufficient to master the credit module and to perform calculation and graphic work. It is desirable to attend practical classes, because they discuss the material needed for practical work and RGR, the teacher demonstrates many subtleties and features of creating programs using Python, which can not be covered during lectures, as well as the defense of practical work..

The grading system is focused on obtaining points for student activity, as well as performing tasks that are able to develop practical skills and abilities.

Control measures missed

Missed control measures (defense of practical work) must be practiced in the next classes, provided that the task is scheduled for the current lesson, or in consultations.

Omissions of writing a module test and express test are not fulfilled.

Calculation and graphic work, which is submitted for inspection in violation of the deadline is evaluated with a decrease in the number of weight points.

Violation of deadlines and incentive points

Encouragement points		Penalty points *	
Criterion	*Weight points*	*Criterion*	*Weight points*
Improving practical work	*1 points (for each practical work)*	Untimely implementation and test of practical work	*From -0.5 points to -5 points (depending on the delivery date)*
Passing distance courses on topics that are agreed with teachers	*5 points*	Untimely execution and test of calculation and graphic work	*From -2 points to -20 points (depending on the construction period)*

Registration of scientific work for participation in the competition of student scientific works	*10 points*		
Writing abstracts, articles, participation in international, national and / or other events or competitions on the subject of the discipline	*5 points*		

* if the control measure was missed for a good reason (illness, which is confirmed by a certificate of the established sample) - penalty points are not accrued.

Academic integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code.

Norms of ethical behavior

Normative principles of behavior of students and employees, defined in sections 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". Read more: https://kpi.ua/code.

Procedure for appealing the results of control measures

Students have the opportunity to raise any issue related to the control procedure and expect it to be addressed according to predefined procedures.

The student has the right to appeal the results of the control measure according to the approved provision on appeals in the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" (approved by the order №NON/128/2021 from 20.05.2021) - https://osvita.kpi.ua/index.php/node/182

Inclusive education

The discipline "Fundamentals of Informatics" can be taught to most students with special educational needs, except for students with severe visual impairments who do not allow to perform tasks using personal computers, laptops and / or other technical means.

Distance learning

Distance learning takes place through the Sikorsky Distance learning Platform «Sikorsky».

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / test tasks, practical work).

Performance of practical works, and also performance of settlement and graphic work, is carried out during independent work of students in a remote mode (with a possibility of consultation with the

teacher through e-mail, social networks).

Learning a foreign language
Teaching in English is carried out only for foreign students.

At the request of students, it is allowed to study the material with the help of English-language online courses on topics that correspond to the topics of specific classes.

8. **Monitor and evaluate the system of evaluation of learning outcomes (Rating System of Evaluation)**

Evaluation system (current control):
1. *Spring semester, 5.5 ECTS credits / 165 hours*

№ s/n	Control measure	%	Weight points	Number	Total
2.	Execution and test of practical works	50	5	10	50
4.	Modular control work (MCW)	20	20	1	20
5.	Calculation and graphic work (CGW)	15	15	1	15
6.	Test work	15	15	1	15
	Total				100

The applicant receives a positive credit score for the results of the semester, if he has a final rating for the semester of at least 60 points and has met the conditions of admission to the semester control, which are determined by the RSE (Rating System of Evaluation).

With applicants who have met all the conditions of admission to the test and have a rating of less than 60 points, as well as with those applicants who want to increase their rating, in the last scheduled lesson in the semester, the teacher conducts semester control in the form of test or interviews.

After performing the test, if the score for the test is higher than the rating, the applicant receives a score based on the results of the test.

If the grade for the test is lower than the rating, a "hard" RSE is used - the previous rating of the applicant (except for points for the semester individual task) is canceled and he receives a grade based on the results of the test. This option forms a responsible attitude of the applicant to the decision to perform the test, forces him to critically assess the level of his training and carefully prepare for the test.

Calendar control *(CC) - is performed twice a semester as monitoring of the current state of compliance with syllabus requirements.*

The purpose of calendar control is to improve the quality of student learning and monitor the implementation of the schedule of the educational process by students.

Criterion			The first CC	The second CC
Deadline of calendar controls			8th week	14th week
Conditions for obtaining a positive result from the calendar control	Current rating		≥ 24 points	≥ 40 points
	Execution practical work	PW № 1- 6	+	+
		PW № 7-10	-	+
	Modular control work	Estimated MCW	-	+
	Calculation and graphic work	Estimated CGW	-	-

In case of detection of academic poor quality during training - the control measure is not credited.

Semester certification of students

	Mandatory condition for admission to the test	Criterion
1	Current rating	RD ≥ 42
2	Obtaining a positive assessment for the performed calculation and graphic work	More than 8 points
3	All practical works are tested	More than 14 points
3	All laboratory works are tested	More than 14 points
4	Writing at least 6 express tests / tests	More than 6 points

The results are announced to each student separately in the presence or remotely (by e-mail). Also recorded in the system "Electronic Campus".

Optional conditions for admission to closure:
1. Activity in practical classes.
2. Activity in laboratory classes.
3. Positive result of the first attestation and the second attestation.
4. Attending 50% of lectures.

Table of translation of rating points to grades on a university scale:

Number points	Assessment on the university scale
100-95	Perfectly / Відмінно
94-85	Very good / Дуже добре
84-75	Good / Добре
74-65	Satisfactorily / Задовільно
64-60	Enough / Достатньо
Less 60	Unsatisfactorily / Незадовільно
Admission conditions are not met	Not allowed / Не допущено

9. Additional information on the discipline (educational component)

The list of questions for preparation for modular control work, and also for preparation for credit is given in appendix 1.

Distance learning through additional online courses on certain topics is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material with such courses is allowed, but students must complete all the tasks provided in the discipline.

The list of courses is offered by the teacher after the students have expressed a desire (because the bank of available courses is updated almost every month).

The student provides a document confirming the completion of the distance course (in the case of a full course) or provides practical tasks from the distance course and subject to an oral interview with the teacher on the topics can receive grades for control measures provided for the studied topics (express control / test tasks, practical work).

Work program of the discipline (syllabus):

Compiled by Associate Professor of Biomedical Engineering, Doctor of Technical Sciences, Shlykov Vladyslav Valentynovych, Head of the Department of Biomedical Engineering.

Approved by the Department of Biomedical Engineering (protocol № ___ to _____)

Approved by the Methodical Commission of the Faculty of Biomedical Engineering (protocol № __ to _____)

The list of questions for preparation for modular control work,

And also for preparation for test

1. The structure of the program in Python. Syntax for describing the function

2. The concept of algorithm and its properties. Types of algorithms and their images in block diagrams.

3. Classical programming algorithms (calculation of sum, product, quantity, finding the maximum sequence, organization of data search).

4. The concept of variable and its properties. Variable declaration syntax. Rules of work of the assignment operator. Record forms.

5. Basic Python data types. Type conversion functions. Convert the results of the calculation of arithmetic expressions.

6. Analysis of conditions. Syntactic constructions and rules of operation of the operator if, else, elif. Rules of logical operations. Rules for calculating logical operations.

7. Memory management in Python. Allocating and freeing memory.

8. Cyclic Python constructs. Syntax and rules of operation of for, while operators. Condition for continuing the cycle.

9. Python containers. General characteristics of containers.

10. Lists and tuples in Python. General characteristics, properties, basic methods of lists. Rules for using memory when working on lists.

11. Dictionaries and sets in Python. General characteristics of dictionaries. Basic methods of dictionaries.

12. Strings in Python. General characteristics of terms and basic methods.

13. OOP Basics in Python. The concept of class, object, class method, class properties.

14. Decorators in Python. Properties and implementation examples. Singleton template.

15. Fundamentals of structural programming. Creating routines. Prototypes of functions. Formal parameters and arguments. Call functions.