National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

Department of Computer Engineering

PYTHON PROGRAMMING TECHNOLOGIES

Syllabus

Requisites of the Course

Level of higher education	*First cycle of higher education (bachelor's degree)*
Field of Study	*12 Information Technologies*
Speciality	*121 Software Engineering* *123 Computer engineering*
Education Program	*Computer Systems Software Engineering* *Computer systems and networks*
Type of Course	*selective*
Mode of Studies	*Full-time/extramural*
Year of studies, semester	*Third year, second semestr*
workload	*5 credits/120 hours*
Testing and assessment	*Credit, Modular control work*
Course Schedule	*//rozklad.kpi.ua*
Language of Instruction	*English*
Course Instructors	Lecturer: *Shevelo O.* alex.shevelo@gmail.com Teacher of laboratory work: Shevelo *O.* alex.shevelo@gmail.com
Access to the course	https://comsys.kpi.ua

Outline of the course

1. Course description, goals, objectives and learning outcomes

The purpose of teaching the discipline is to acquire the knowledge, skills and abilities necessary for a specialist who specializes in the development and design of modern software, especially the backend.

The purpose of the discipline is the formation of a number of competencies among students, namely:

– familiarization with the concepts and basic approaches to the design of modern software;

– studying the principles and methods of choosing technologies for a specific task;

– studying of technologies and principles of building highly loaded services;

– familiarization with the organization and methodology of organizing the work of development teams;

– learning when to and when not to use PYTHON.

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

knowledge of:

– in which cases is enough basic knowledge of programming (OOP, ASID, SOLID, etc.), and when you need to create your own approach;

– what is Trade-of analysis and how to properly conduct it;

– The full range of elements included in the term "technology" in the development of modern software;

– Principles of working with risks.

skills:

- to navigate the methods and technology choices in software development;
- determine optimal technologies depending on the project;
- to navigate the issues of design, construction, operation of projects in the long term.

2. Prerequisites and post-requisites of the course (the place of the course in the scheme of studies in accordance with curriculum)

Necessary disciplines: "Programming", "Object-oriented programming", "System programming", "Data structures and algorithms", "Software engineering", "Algorithms and calculation methods".

Disciplines based on learning outcomes from disciplines: "System software", "Computer systems".

3. Content of the course

Section 1. The concept of technology
Topic 1.1. Definition of technology
Topic 1.2. The main elements of the system that influence the choice of technologies
Topic 1.3. Requirements for the selected technologies, which should prevent the project from reaching a dead end

Section 2. Methods of system analysis
Topic 2.1. System description schemes and their types
Topic 2.2. Risk analysis and Trade-of analysis

Section 3. Working with requirements
Topic 3.1. What are requirements, their types and why it is important
Topic 3.2. Methods of obtaining requirements

Section 4 . Overview of the most popular technologies.
Topic 4.1. Types of architectural templates and their purpose.
Topic 4.2. Monoliths and their purpose, an overview of technologies suitable for them.
Topic 4.3. Microservices and their purpose, an overview of technologies suitable for them.
Topic 4.4. Serverless systems and their purpose, an overview of technologies suitable for them.
Topic 4.5. Types of databases and methods of database selection for the project

Section 5 . Technologies of further project development and support
Topic 5.1. How to avoid a dead end if the wrong technology was chosen
Topic 5.2. Refactoring\reengineering\optimization and the required technologies
Section 6. Server support technologies.
Topic 6.1. Cloud services and their purpose
Topic 6.2. Methods of choosing cloud services
Topic 6.3. Cases when it is not recommended to use cloud services

Section 7. Modern technologies of development teams organization.
Topic 7.1. AGILE base
Topic 7.2. SCRUM vs CANBAN

4. Coursebooks and teaching resources

Basic:

1. Pierre Bourque, Richard Fairley, Guide to the Software Engineering Body of Knowledge, Version 3.0 SW

2. I. Sommerville, Software Engineering, 10th ed., Addison-Wesley, 2016

3. K.E. Wiegers, Software Requirements, 3rd ed., Microsoft Press, 2013..

4. P. Clements et al., Documenting Software Architectures: Views and Beyond, 2nd ed., Pearson Education 2016.- 360 p.

5. D. Budgen, Software Design, 2nd ed., Addison-Wesley, 2013

6. L. Bass, P. Clements, and R. Kazman, Software Architecture in Practice, 3rd ed., Addison-Wesley Prof

7. Fundamentals of programming. Python. Part 1 [Electronic resource]: textbook for students. specialty 122 "Computer science", specialization "Information technologies in biology and medicine" / A. V. Yakovenko; Igor Sikorsky Kyiv Polytechnic Institute. – Electronic text data (1 file: 1.59 MB). – Kyiv: Igor Sikorsky Kyiv Polytechnic Institute, 2018. – 195 pages. https://ela.kpi.ua/bitstream/123456789/25111/1/Python.pdf

***Additional**:*

1. Steve McConnell, Software Estimation: Demystifying the Black Art

2. John Dooley, Software Development and Professional Practice

3. Robert C. Martin, Clean Code: A Handbook of Agile Software Craftsmanship

Information resources

***1**: Python Programming language https://www.youtube.com/watch?v=9oZ4h3AbrJM*

2. https://pythonguide.rozh2sch.org.ua/

Educational content

5. Methodology

Full-time education

Section and topic titles	Amount of hours			
	Total	Including		
		Lectures	Laboratory works	Self-study
Section 1. . The concept of technology Topic 1.1. Definition of technology Topic 1.2 The main elements of the system that influence the choice of technologies Topic 1.3. Requirements for the selected technologies, which should prevent the project from reaching a dead end	7	2	1	4

Section 2. Methods of system analysis Topic 2.1. System description schemes and their types Topic 2.2. Risk analysis and Trade-of analysis	10	4	2	4
Section 3. Working with requirements Topic 3.1. What are requirements, their types and why it is important Topic 3.2. Methods of obtaining requirements	7	2	1	4
Section 4 . Overview of the most popular technologies. Topic 4.1. Types of architectural templates and their purpose. Topic 4.2. Monoliths and their purpose, an overview of technologies suitable for them. Topic 4.3. Microservices and their purpose, an overview of technologies suitable for them. Topic 4.4. Serverless systems and their purpose, an overview of technologies suitable for them. Topic 4.5. Types of databases and methods of database selection for the project	40	12	8	20
Section 5 . Technologies of further project development and support Topic 5.1. How to avoid a dead end if the wrong technology was chosen Topic 5.2. Refactoring\reengineering\optimization and the required technologies	15	4	1	10
Section 6. Server support technologies. Topic 6.1. Cloud services and their purpose Topic 6.2. Methods of choosing cloud services Topic 6.3. Cases when it is not recommended to use cloud services	11	4	3	4
Section 7. Modern technologies of development teams organization. Topic 7.1. AGILE base Topic 7.2. SCRUM vs CANBAN	12	5	2	5
Modulat control work	6	1		5
Credit	12	2		10
Total	**120**	**36**	**18**	**66**

Extramural form of education

Section and topic titles	Amount of hours			
	Total	Including		
		Lectures	Laboratory works	Selfstudy
Section 1. The concept of technology Topic 1.1. Definition of technology Topic 1.2. The main elements of the system that influence the choice of technologies Topic 1.3. Requirements for the selected technologies, which should prevent the project from reaching a dead end	10	1	1	8
Section 2. Methods of system analysis Topic 2.1. System description schemes and their types Topic 2.2. Risk analysis and Trade-of analysis	9		1	8
Section 3. Working with requirements Topic 3.1. What are requirements, their types and why it is important	5	1		4

Topic 3.2. Methods of obtaining requirements				
Section 4 . Overview of the most popular technologies. Topic 4.1. Types of architectural templates and their purpose. Topic 4.2. Monoliths and their purpose, an overview of technologies suitable for them. Topic 4.3. Microservices and their purpose, an overview of technologies suitable for them. Topic 4.4. Serverless systems and their purpose, an overview of technologies suitable for them. Topic 4.5. Types of databases and methods of database selection for the project	25	1	2	22
Section 5 . Technologies of further project development and support Topic 5.1. How to avoid a dead end if the wrong technology was chosen Topic 5.2. Refactoring\reengineering\optimization and the required technologies	17	1		16
Section 6. Server support technologies. Topic 6.1. Cloud services and their purpose Topic 6.2. Methods of choosing cloud services Topic 6.3. Cases when it is not recommended to use cloud services	18	1	2	15
Section 7. Modern technologies of development teams organization. Topic 6.1. AGILE base Topic 6.2. SCRUM vs CANBAN		1	2	15
Modular control work	6	1		5
Credit	12	1		11
Total	**120**	**8**	**8**	**104**

The purpose of conducting laboratory work is the acquisition by students of the necessary practical skills of using modern programming technologies in the PYTHON language.

Full-time education

№	**Laboratory work title**	**Amount of hours**
1	Selection of the project topic and initial requirements for it	**2**
2	Basic schemes and diagrams of the project and the stack	**4**
3	Selection of project organization method	**6**
4	**MVP writing**	**6**

Extramural form of education

№	**Laboratory work title**	**Amount of hours**
1	Selection of the project topic and initial requirements for it	**2**
2	Basic schemes and diagrams of the project and the stack	**2**

3	Selection of project organization method	**2**
4	**MVP writing**	**2**
	Total	**8**

6. Selfstudy

Preparation for laboratory works 18 hours. Preparation for modular control works 8 hours. Preparation for the test is 10 hours.

Policy and Assessment

7. Course policy

During classes in an academic discipline, students must adhere to certain disciplinary rules:
1) it is forbidden to be late for classes;
2) when the teacher enters the classroom, as a sign of greeting, students must stand up;
3) irrelevant conversations or other noise interfering with classes are not allowed;
4) leaving the classroom during the lesson is allowed only with the teacher's permission;
5) it is not allowed to use mobile phones and other technical devices without the teacher's permission.

Laboratory works are submitted in person with a preliminary check of theoretical knowledge, which is necessary for laboratory work. Verification of laboratory results includes code verification and test tasks.
During the course the teacher has the right to award up to 5 additional points for early completion of laboratory work, for a demonstration of creative approach, or for active participation in the discussion of issues related to the subject of a lecture or practical session.
The teacher may assign up to 5 penalty points for completing and submitting laboratory work after the specified deadline, for a significant number of missed classes, or for violating the rules of behavior in classes.

8. Monitoring and grading policy

- Current control: laboratory works control
- Calendar control: modular control work

It is held twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements.
Semester control: credit
Requirement for semester control: semester rating more than 40 points.
Evaluation of individual types of educational work performed by the student is carried out in points:

Educational work type	Max amount of points	Total amount of points
Performance and protection of laboratory work 1	15	**85**
Performance and protection of laboratory work 2	20	
Performance and protection of laboratory work 3	25	
Performance and protection of laboratory work 4	25	
Writing modular control work		**15**
Total		**100**
Credit (optional)	30	

Table of correspondence of rating points to grades on the university scale:

Points amount	*Grade*
100-95	Excellent
94-85	Very good
84-75	Good
74-65	Satisfactory
64-60	Sufficient
Below 60	Fail
Course requirements are not met	Not admitted

9. Additional information on the discipline (educational component)

The list of theoretical questions submitted for semester control is given in Appendix 1

Requirements for additional points During the ≪PYTHON PROGRAMMING TECHNOLOGIES course it is allowed to credit obtained During the ≪ PYTHON PROGRAMMING TECHNOLOGIES ≫ course it is allowed to credit obtained points obtained as a result of distance courses on the “Coursera” platform subject to prior agreement with the teacher and receiving an official certificate.

The syllabus was:

Compiled by the assistant of the Department of Computer Engineering, O.P. Shevelo.

Approved by the Department of Computing Technics (Protocol No. 10 dated 05/25/2022)

Agreed by the Methodical Commission of the faculty (protocol No. 10 dated 06/09/2022)

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