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

Computer Systems
Software Department

Fundamentals of Cloud Technologies

Syllabus

Requisites of the Course

Cycle of Higher Education	***First (Bachelor)***
Field of Study	*12 Information technologies*
Speciality	*121 Software Engineering*
Education Program	*Software Engineering of Multimedia and Information Retrieval Systems*
Type of Course	*Selective*
Mode of Studies	*full-time*
Year of studies, semester	*3 year, 6 semester*
ECTS workload	*36 hours for lectures, 18 hours for practicals, 66 hours for self-study*
Testing and assessment	*Credit, modular test, calendar control*
Course Schedule	*According to http://roz.kpi.ua/*
Language of Instruction	*English*
Course Instructors	*Lecturer: Ph.D., associate professor, Nataliya A. Rybachok,* *Linkedin: https://www.linkedin.com/in/nataliia-rybachok-0903bb252/* *e-mail: rybachok.nataliia@lll.kpi.ua* *Telegram: https://t.me/Nataliia_Rybachok* *Laboratory work: Ph.D., associate professor, Nataliya A. Rybachok*
Access to the course	*Google classroom.*

Program of educational discipline

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

Studying the discipline "Fundamentals of Cloud Technologies" allows students to develop the competencies necessary for solving practical problems of professional activity related to the use of AWS cloud services.

*The **purpose** of studying the discipline "Fundamentals of Cloud Technologies" is the formation of students' abilities to independently create virtual machines, subnets, install web servers, deploy and update static sites, create and maintain databases, repositories.*

*The **subject** of the discipline "Fundamentals of Cloud Technologies" is cloud technologies and their services.*

The study of the discipline "Fundamentals of Cloud Technologies" allows students to develop the competencies necessary for solving practical problems of professional activity, related to the use of IIS and Nginx web servers, which are installed on virtual machines with operating systems of the Windows and Linux family, located on Azure cloud platforms.

The study of the discipline "Fundamentals of cloud technologies" contributes to the formation of the following General competencies (GC) for students according to the educational program:

***GC5** Ability to learn and use modern knowledge.*

GC6 *Ability to search, process and analyze information from various sources.*

The study of the discipline "Fundamentals of Cloud Technologies" contributes to the formation of the following program learning outcomes (PLO) for students according to the educational program:

PC8 *Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems.*

The study of the discipline "Fundamentals of Cloud Technologies" contributes to the formation of the following program learning outcomes (PLO) for students according to the educational program:

PLO01 *To analyze, purposefully search and select the necessary information and reference resources and knowledge to solve professional problems, taking into account modern advances in science and technology.*

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

The success of studying the discipline "Fundamentals of Cloud Technologies" does not depend on other disciplines of the curriculum of bachelor's training in the specialty 121 Software Engineering.
The theoretical knowledge and practical skills obtained during the mastering of the discipline "Fundamentals of Cloud Technologies" ensure the successful completion of course and diploma projects, master's theses in the specialty 121 Software Engineering.

2. Content of the academic discipline

The discipline "Fundamentals of Cloud Technologies" involves the study of the following topics:
Topic 1. Cloud Concepts
Topic 2. Cloud Services
Modular test
Credit

3. Educational materials and resources

Basic References:

1. AWS documentation

https://docs.aws.amazon.com/

2. AWS Academy Cloud Foundations

https://awsacademy.instructure.com/courses/39975

3. Methodological instructions for performing laboratory work in the discipline "Fundamentals of Cloud Technologies".

Use to master the practical skills of the discipline.

The materials are in Google classroom.

Additional References:

4. AWS Academy Data Center Technician Course

https://awsacademy.instructure.com/courses/12156/

5. Local File Systems (Windows) | Microsoft Learn

https://learn.microsoft.com/en-us/previous-versions/windows/desktop/legacy/aa364407(v=vs.85)

6. SSH Command - Usage, Options, Configuration

https://www.ssh.com/academy/ssh/command

Educational content

5. *Methodology*

№	*Training session type*	*Lesson description*
		Topic 1. Cloud Concepts
1	*Lecture 1. Cloud Concepts Overview*	*Introduction to cloud computing Advantages of the cloud Introduction to AWS Moving to the AWS Cloud Models of cloud services. Major cloud providers (AWS, Azure, GCP).Comparison of public, private and hybrid clouds. 1,2*
2	*Task 1. How to access and use AWS Academy Learner Lab Services*	*Accept course invitation, read Guide 3*
3	*Lecture 2. Cloud Economics and Billing*	*Total cost of ownership, AWS Organizations, AWS billing and cost management, Billing dashboards, Technical support models 1,2*
4	*Task 2. Simple Monthly Calculator*	*Estimate an elastic EC2, IP address costs 3*
5	*Lecture 3. Basic concepts of cloud computing and virtualization*	*The concept of the main components of architecture, regions of availability, AWS Global Infrastructure, AWS services and service categories 1,2*
		Topic 2. Cloud Services
6	*Lecture 4. Cloud Security*	*AWS shared responsibility model, AWS IAM, Securing a new AWS account, Securing accounts, Securing data, Working to ensure compliance 1,2*
7	*Task 3. Introduction to AWS IAM*	*Create 3 groups with different rights, create a user in each group, check the validity of rights 3*
8	*Lecture 5. OSI model and protocol stack TCP/IP*	*MAC address, IP addressing, public and private addresses, main TCP and UDP ports, CIDR 4*
9	*Lecture 6. Networking and Content Delivery*	*Networking basics, Amazon VPC, VPC networking, VPC security, Route 53, CloudFront 1,2*
10	*Task 4. Build a VPC and Launch a Web Server*	*Create a VPC, create subnets, configure a security group, launch an EC2 instance into a VPC 2*
11	*Lecture 7. Features of*	*Compute services overview,*

	creation of VM on AWS	*Amazon EC2 Amazon, EC2 cost optimization, Container services, Introduction to AWS Lambda* *1,2*
12	*Task 5. How to create a Windows Server 2019 Gen2 VM on the AWS and manage VM via mobile app*	*Create a Windows VM, configure RDP access, use mobile app for managing VM* *3*
13	*Lecture 8. Hardware and OS subsystems*	*Motherboard, CPU, memory, storage drives, network card processes, file systems, memory management, networking* *4*
14	*Task 6. How to find out information about a VM on AWS and main OS*	*define VM parameters from the OS* *define public and private addresses;* *define public IP addresses locations* *3*
15	*Lecture 9. Service Storage*	*AWS EBS, AWS EFS, AWS S3 Glacier* *1,2*
16	*Task 7. EBS*	*Create an Amazon EBS volume, Attach and mount volume to an EC2 instance, create a snapshot of volume, create a new volume from the snapshot, attach and mount the new volume to your EC2 instance* *2*
17	*Lecture 10. Windows File system structure*	*Windows File system structure* *5*
18	*Lecture 11. Windows File system structure and SSH*	*SSH. Structure, placement in the file system, settings* *6*
19	*Task 8. Access Windows VM via SSH*	*Install, configure and use SSH to access VM* *3*
20	*Lecture 12. Databases*	*Amazon RDS, Amazon DynamoDB, Amazon Redshift, Amazon Aurora* *1,2*
21	*Task 9. Build a Database Server*	*Launch an Amazon RDS DB instance , configure the DB instance to permit connections from your web server, open a web application and interact with database* *2*
22	*Lecture 13. Cloud Architecture*	*AWS Well-Architected Framework design principles, Operational excellence, Security, Reliability, Performance efficiency, Cost optimization, Reliability & high availability, AWS Trusted Advisor* *1,2*
23	*Lecture 14. Automatic Scaling and Monitoring*	*Elastic Load Balancing, Amazon CloudWatch, Amazon EC2 auto scaling* *1,2*
24	*Task 10. Scale & Load Balance your Architecture*	*Create a VM, create a load balancer, create a launch configuration and an Auto Scaling group, automatically scale new instances within a private subnet, create Amazon CloudWatch alarms and monitor performance of your infrastructure.* *2*

25	Modular test

6. Self-study (supplementary reading)

No	The name of the topic that is submitted for independent study	Hours of study	References
1	Preparation to the lectures	20	1,2,4,5,6
2	Preparation to the tasks	26	3
24	Preparation to the modular test	10	1,2,4,5,6
25	Preparation to the credit	10	1, 2, 3, 4, 5, 6

Policy and Control

7. Course policy

Students are required to be on time to attend all the lessons according to the timetable, and adhere to the code of ethical conduct. To successfully complete the course students need to study coursebook materials and use learning resources available in print, in digital form, and online. Regular attendance at the lessons, self-study and continuous revisions are essential for completion of the course.

According to the Code of Honour of the university (https://kpi.ua/code) students are expected to be self-disciplined, well-behaved, considerate, honest and responsible.

During the course, writing an essay/ a conference abstract, presenting at a conference, taking part in a language contest/ university project will bring rewarding points added to the student's performance score.

8. Monitoring and grading policy

During the semester, students perform 10 computer classes. The maximum number of points for computer class: 6 points.

Points for computer class are calculated for:

- quality of the computer clases: 0-4 points;

- answer during the defense of the computer clases: 0-2 points.

Performance evaluation criteria:

4 points – the computer class is done qualitatively, in full;

3 points – the computer class is done qualitatively, in full, but has flaws;

2 points – the computer class is completed in full, but contains minor errors;

1 points – the computer class is completed in full, or contains significant errors;

0 points – the computer class is not fully completed.

Answer evaluation criteria:

2 points – the answer is complete, well-argued;

1 point – in general, the answer is correct, but has flaws or minor errors;

0 points – there is no answer or there are significant errors in the answer.

The maximum number of points for performing and defending computer classes:

6 points × 10 = 60 балів.

*The assignment for **the modular test** consists of 40 tests questions. The answer to each question is worth 1 points.*

Evaluation criteria for each test question:
1 – the answer is correct;
0 point – no answer or the answer is incorrect.

The maximum number of points for a modular test:

1 points × 40 theoretical test question = 40 points.

The rating scale for the discipline is equal to:
R = 60 points + 40 points = 100 points.

Calendar attestation of students (8 and 14 weeks of semesters) for the discipline is carried out according to the value of the current rating of the student at the time of attestation. If the value of this rating is not less than 50% of the maximum possible at the time of certification, the student is considered satisfactorily certified. Otherwise, in the attestation statement is set "unsatisfactory".

A necessary condition for obtaining a test by a student is the performance modular control work and defense of all laboratory works with a sum of at least 60%. Students who do not have academic debt can also increase their grades by taking a final test.

The final performance score or the results of the Final/ Pass Test are adopted by university grading system as follows:

Score	*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 Graded*

9. Additional information about the course

Syllabus of the course

Is designed by teacher PhD, *associate professor, Nataliya A. Rybachok,*

Adopted by Computer Systems Software Department (protocol № 8 from 25.01.23)

Approved by the Faculty Board of Methodology (protocol № 6 from 27.01.23)