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

Computer Systems Software Department

Linux operating systems administration

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

The study of the discipline "Linux operating systems administration" allows students tto develop the competencies necessary for solving practical tasks of professional activity related to the administration of operating systems of the Linux family.

The purpose of studying the discipline "Administration of Linux operating systems" is the formation of students' abilities to independently create virtual machines in the AWS cloud, install web servers, configure access via VMs using the SSH protocol, manage the main resources of the OS (files, users, processes, services), analyze OS logs, configure OS integration with Google, Microsoft services.

The subject of the discipline "Administration of Linux operating systems" is cloud technologies, operating systems of the Linux family, basic OS resources, system utilities, access protocols to remote OSs.

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 "Linux operating systems administration" contributes to the formation of the following professional competence (PC) in 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 "Linux operating systems administration" 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 "Linux operating systems administration" 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 "Linux operating systems administration" 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 "Linux operating systems administration" involves the study of the following topics:
Topic 1. Introduction to virtualization and cloud technologies
Topic 2. Operating system (OS) resource management
Modular test
Credit

3. Educational materials and resources

Basic References:

1. LPIC-1 Linux Professional Institute Certification Study Guide: Exam 101-500 and Exam 102-500 5th Edition / Christine Bresnahan, Richard Blum. - John Wiley & Sons, 2015. - 696 p.

2. AWS cloud platform documentation

https://learn.microsoft.com/en-us/azure/

3. Methodological instructions for performing laboratory work in the discipline "Linux operating systems administration".

The materials are in Google classroom.

Additional References:

4. SSH Command - Usage, Options, Configuration

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

5. Nginx home page

https://www.nginx.com/

Educational content

5. Methodology

№	Training session type	Lesson description
	Topic 1. Cloud technologies and Deploying Websites	
1	Lecture 1. Basic concepts of OS	Definition, purpose, tasks of operating systems (OS) 1
2	Lecture 2. Virtualization	types of virtualization: at the level of OS resources, virtual machines (types of virtual machines), containers 1
3	Lecture 3. Introduction to cloud technologies	Popular cloud computing services; main cloud providers (AWS, Azure, GCP); advantages of cloud computing; cloud service provision models (IaaS, PaaS, SaaS); cloud types (public, private, hybrid). 2
4	Lecture 4. AWS cloud platform services	AWS cloud platform services. Foundations account management: AWS free tier, creating an AWS account. The AWS console. Introduction to AWS core services: VPC, EC2, RDS, S3, Route 53, ELB, Lambda, ECS. 2

5	Task 1. How to access and use AWS Academy Learner Lab Services	to create a student account for AWS Learning Management System and to learn about the capabilities of the AWS Academy Learner Lab 3
6	Lecture 5. Creating and configuring a VM on the AWS platform	Creation of a checklist for planning virtual machines, determining the location of virtual machines and pricing models; determination of the correct size of the virtual machine; virtual machine storage size settings; connecting to a virtual machine 2
7	Task 2. How to install and configure AWS Linux VM	to launch Linux VM, to access via SSH 3
8	Lecture 6. SSH protocol	Viewing server/client FS, basic configuration file options, managing services/daemons, managing firewalls/security rules, connecting by password/keys, using ssh for remote management 1,4
9	Lecture 7. OSI model and protocol stack TCP/IP	MAC address, IP addressing, public and private addresses, main TCP and UDP ports, CIDR 1
10	Task 3. How to find out information about a VM on AWS portal and main OS	define VM parameters from the OS; define public and private addresses on AWS portal; define public and private addresses from the OS 3
11	Lecture 8. Interfaces of operating systems	Graphical UI, command line, API 1
12	Task 4. How to get help in Linux	To get help using help and man utilities 3
Topic 2. Computer system resource management		
13	Lecture 9. File systems (FS)	Logical organization of FS. Features of FS Linux and Windows. Types of files and features of working with them. User rights. Masks 1
14	Task 5. How to find files in Linux	Find utility usage 3

15	*Task 6. File management in Linux OS*	*to create, rename, delete, move, copy, files and folders, file' right and masks management* *3*
16	*Lecture 10. Disks*	*Disks, partitions, file systems, mounting, automounting.* *1*
17	*Task 7. How to manage disk partitions in Linux*	*To create partition, to format partition, to create file system, to automount partition* *3*
18	*Lecture 11. Users' management*	*Basic user operations (create, update, delete groups and users). Presentation groups and users in OS.* *1*
19	*Lecture 12. Nginx web server. Server operations. File system view.*	*Nginx web server. Server operations. File system view.* *5*
20	*Task 8. How to install Nginx server and create subsites*	*To install Nginx server, to create users, create subsites* *3*
21	*Lecture 13. Management of processes and tasks*	*Peculiarities of implementing processes in Linux. Attributes process services. Management utilities.* *1*
22	*Task 9. How to host a site on the Ubuntu server*	*To create a directory structure on the server, to upload template site to the server* *3*
23	*Lecture 14. Basic Linux configuration files*	*Implementation of the principle "everything is a file" in Linux. Basic OS resources. Location of configuration files.* *3*
24	*Task 10. How to manage processes and tasks*	*Top, job, ps utilities usage* *3*
	Modular test	

2. **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
2	Preparation to the tasks	26	3
24	Preparation to the modular test	10	1,2,4,5
25	Preparation to the credit	10	1, 2, 3, 4, 5

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 clase is done qualitatively, in full;
3 points – the computer clase is done qualitatively, in full, but has flaws;
2 points – the computer clase is completed in full, but contains minor errors;
1 points – the computer clase is completed in full, or contains significant errors;
0 points – the computer clase 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 23.03.22)

Approved by the Faculty Board of Methodology (protocol № 6 from 25.03.22)