Course Syllabus

I. General Information

Course name	Operating systems
Programme	Informatics
Level of studies (BA, BSc, MA, MSc, long-cycle MA)	I
Form of studies (full-time, part-time)	full-time
Discipline	Informatics
Language of instruction	English

Course coordinator	dr Viktor Melnyk prof. KUL

Type of class *(use only the types mentioned below)*	Number of teaching hours	Semester	ECTS Points
lecture	15	IV	3
tutorial			
classes			
laboratory classes	30	IV	
workshops			
seminar			
introductory seminar			
foreign language classes			
practical placement			
field work			
diploma laboratory			
translation classes			
study visit			

Course pre-requisites	PR_01 - knowledge of informatics covered by the high school program. PR_02 - basic knowledge of computer architecture. PR_03 - knowledge of the basics of programming. PR_04 - Good computer skills.

II. Course Objectives

C_01 - to familiarize students with the basic concepts and ideas used in operating systems, both historical and contemporary.
C_02 - to present specific solutions used in Unix and Windows operating systems families.

III. Course learning outcomes with reference to programme learning outcomes

Symbol	Description of course learning outcome	Reference to programme learning outcome
KNOWLEDGE		
W_01	Theoretical knowledge of operating systems, used data structures and algorithms	K_W01 K_W04
W_02	The student knows the functions of basic directories	K_W01 K_W04
W_03	The student knows devices naming and representation of them as files	K_W01 K_W04
W_04	The student has knowledge of the basic shell commands and utilities commands	K_W01 K_W04
W_05	The student knows the basic configuration of DNS, SMTP, POP3, WWW	K_W01 K_W04
SKILLS		
U_01	Ability to use the developer tools on Unix/Linux	K_U01 K_U02
U_02	Knowledge of the selected API system functions of the Unix/Linux operating system	K_U01 K_U02 K_U04
U_03	Basic ability to create and manage processes on Unix/Linux	K_U01 K_U02
U_04	The student is able to install the desired distribution of Unix/Linux	K_U01 K_U02 K_U04
U_05	The student is able to manage users and security groups, as well as read and give them permissions to the files	K_U01 K_U02 K_U17
U_06	The student is able to mount and unmount the device in the directory tree	K_U01 K_U02
U_07	The student is able to configure basic system settings from the command line	K_U01 K_U02
U_08	The student is able to run basic services available in Unix/Linux	K_U01 K_U02 K_U04
U_09	The student is able to write simple scripts in a shell	K_U01 K_U02 K_U04
SOCIAL COMPETENCIES		
K_01	skillfully solve complex problems with which they can meet in life, using the known operating system principles, objectively assessing the results	K_K01 K_K02
K_02	follow ethical standards applicable in the IT industry	K_K01 K_K04
K_03	work efficiently, in teams and individually, skillfully assessing priorities in the implementation of the project	K_K01 K_K02

IV. Course Content

LECTURES

1. Essence, the role and tasks of the operating system. Types of operating systems. The structure of the system. Historical sketch of development of operating systems - from batch to interactive systems.
2. The evolution of operating systems. The properties and desired features of operating systems. Processes, processors, concurrent processing. Resources, processes and threads.
3. Planning the processor allocation. Planning algorithms and assessment criteria. Implementation of processes and threads planning algorithms.
4. System mechanisms for process synchronization. Communication between processes - mutual exclusion, synchronization and locking. Semaphores - principle of operation, implementation. The use of semaphores in inter-process communication.

5. Memory hierarchy. Main memory management. Main memory control and allocation.
6. Memory management - objectives. Virtual memory - implementation.
7. File systems - folders, sharing and data protection. Logical and physical organization of the file system. Methods of organization of the auxiliary memory. The integrity of the file system.
8. Input / output system and its mechanisms. Types of input-output devices. The structure of the input-output mechanism. Buffering.

LABOATORY CLASSES
1. Installation of the system.
2. Introduction and maintenance of the file system in Linux.
3. Linux - console. Operations on directories and files. User accounts. Mounting and unmounting of the devices.
4. Processes, variables, programs, files, standard output and input.
5. Filters, standard streams and stream processing.
6. Creating shell scripts for the Linux operating system.
7. Work with vi editor.
8. Work with joe editor.
9. Windows: Power shell, batch files

V. Didactic methods used and forms of assessment of learning outcomes

Symbol	Didactic methods *(choose from the list)*	Forms of assessment *(choose from the list)*	Documentation type *(choose from the list)*
KNOWLEDGE			
W_01	Conventional lecture	Exam / Written test	Evaluated test / written test
W_02, W_03, W_04, W_05	Conventional lecture, Laboratory classes	Exam / Written test, Test of practical skills, Observation	Evaluated test / written test, Rating card / Observation report, Protocol / report printout/ report file
SKILLS			
U_01 - U_09	Laboratory classes, Practical classes design thinking	Test of practical skills, Observation	Rating card / Observation report Protocol / report printout/ report file
SOCIAL COMPETENCIES			
K_01, K_02	Conventional lecture, Laboratory classes design thinking	Exam / Written test, Test of practical skills, Observation	Evaluated test / written test, Rating card / Observation report, Protocol / report printout/ report file
K_03	Laboratory classes design thinking	Test of practical skills, Observation	Rating card / Observation report, Protocol / report printout/ report file

VI. Grading criteria, weighting factors…

The condition for passing the classes is the student's presence, executing laboratory works and obtaining grades, getting a positive assessment for the answers to the control questions in each laboratory work.

The final grade for the classes is formed as the laboratory work execution results - 70%, the presence - 30%.

The exam (for those who passed the exercises) consists in conducting a test of the knowledge provided during the lecture. The exam grade is formed on the basis of two components:

70 % - written answers to test tasks and oral answers in case of doubt,

30% - the grade obtained from the exercises.

A grading scale is given below:

Less than 50% - unsatisfactory (2.0).

Detailed assessment rules are given to students with each subject edition.

VII. Student workload

Form of activity	Number of hours
Number of contact hours (with the teacher)	**45**
Number of hours of individual student work	**60**

VIII. Literature

Basic literature
1. Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems (4th Edition). Pearson, 2014, 1136 pages. 2. William Stallings: Operating Systems: Internals and Design Principles (9th Edition). Pearson; 2017, 800 pages. 3. Shekhovtsov V. Operating systems : Textbook for high-school students. BHV, 2005. 4. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 8th Edition. John Wiley & Sons; ;8th edition (2008), 971 P.
SUPPLEMENTARY literature
1. M.J. Bach: Budowa systemu operacyjnego Unix, WNT, Warszawa 1994 2. T.W. Ogletree: Windows XP PL. Księga eksperta, Helion, Gliwice 2002 3. U. Vahalia: Jądro systemu Unix, WNT, Warszawa 2000 4. D.A. Solomon: Inside Windows NT, Microsoft Press, 1998 5. B. Goodheart, J. Cox: Sekrety magicznego ogrodu. UNIX® System V Wersja 4 od środka. WNT, Warszawa 2001. 6. U. Vahalia: Jądro systemu UNIX®. Nowe horyzonty. WNT, W-wa, 2001. 7. D. A. Solomon, M. E. Russinovich: Microsoft Windows® 2000 od środka, Helion, 2003. 8. R. Lowe: Kernel Linux. Przewodnik programisty, Helion, 2004 9. Daniel P. Bovet, Marco Cesati , Understanding the Linux Kernel, 3rd Edition. O'Reilly Media (November 2005): 944 Pages. 10. Jonathan Levin, Mac OS X and iOS Internals: To the Apple's Core. Wiley (2012), 864 pages