

Course unit title	Course unit code
<b>OPERATING SYSTEMS AND THEIR SECURITY</b>	

Lecturer (s)	Department where course unit is delivered
Martas Ambraziunas	Vilnius University, Kaunas Faculty Muitinès str.. 8, LT-44280, Kaunas

Cycle	Level of course unit	Type of the course unit
I (first)	1/1	Compulsory

Mode of delivery	Semester or period when the course unit is delivered	Language of instruction
Auditoria/Remote	2	Lithuanian/English

Prerequisites and corequisites	
<b>Prerequisites:</b> Computer Architecture	<b>Corequisites:</b>

Number of ECTS credits allocated	Student 's workload	Contact work hours	Individual work hours
5	130	52	78

Purpose of the course unit: programme competences to be developed		
To acquaint students with basic OS concepts and functions including control over software and hardware. Learn to monitor OS performance as well as automated tasks using different tools and scripting languages.		
Learning outcomes of course unit	Teaching and learning methods	Assessment methods
Knowledge about PC hardware interaction with software and main role of OS in this process. Ability to monitor and interact with OS using build-in terminal (console) environments (Powershell, Bash) and .Net languages (F#,C#) as well as third party tools.	Lectures, exercises, individual work	Lab exercises Synopses Midterm Exam Exam

Course content: breakdown of the topics	Contact work hours							Individual work hours and tasks	
	Lectures	Seminars	Practice classes	Laboratory	Consultation	Practice	All contact work	Individual work	Tasks
Definition of computer system, its elements and functions. Definition of OS its functions and elements. OS efficiency criteria and classification. Major families of OS.	2			2			4	6	Literature studies; preparation for midterm exam lab exercises;

Introduction to Windows Powershell scripting language: main concepts, syntax and use cases.	2			2			6	6	synopses presentations  preparation for exam
Definition of Bus and its functions in computer system. Bus types and hierarchies. Bus arbitration and Bus arbiter.	2			2			5	5	
Definition of CPU and its functions as well as internal structure. Moore's Law. CPU data flows. Instruction cycle and pipelining. Machine code and assembly code.	2			2			5	5	
Definition of memory in computer system and its functions. Main memory characteristics and memory hierarchy. RAM and ROM memory. Storage or secondary memory. Cache memory architecture.	2			2			5	5	
Introduction to .Net F# programming/scripting language and .Net libraries that are used for processes, services, logs information acquisition (including VMI).	2			2			6	6	
Definition of Input/Output (I/ O) system and its functions. I/O device structure. I/O module and I/O operation types.	2			2			5	5	
Memory management. OS memory management functions. Memory allocation methods. Memory fragmentation and defragmentation. Virtual memory. Memory address types.	2			4			7	7	
Process management. Process states and processes queue (scheduling algorithms). Process descriptor and context. Process synchronization and interaction. A critical section and deadlocks. Threads (thread).	2			2			5	5	
Introduction to Bash (Unix Shell). Main language concepts, syntax and use cases.	2			4			6	6	
File system. The file system attributes. Access to file legislation. Global file system model. Modern file systems architecture.	2			2			5	5	
OS security. Types of OS security breaches and thread sources. Countermeasures: authentication, authorization, cryptography, security procedures.	2			2			5	7	
<b>Total:</b>	24			28			52	78	

Assessment strategy	Com para tive weig ht perc enta ge	Date of examinat ion	Assessment criteria
Lab. exercise 1	10 %	3 week.	Exercise with Windows OS monitoring tools (Sysinternals) and selected third party monitoring software. Assessed in grades 1-10 based on quality of implementation and delivery time.
Lab. Exercise 2	10 %	5 week.	Exercise with Windows Powershell (Basic operations, process management). Assessed in grades 1-10 based on quality of implementation and delivery time.
Lab. Exercise 3	10 %	7 week.	Exercise with Windows Powershell (services and registries management, logs monitoring, scheduled tasks). Assessed in grades 1-10 based on quality of implementation and delivery time.
Lab. exercise 4	10 %	8-11 week.	Exercise with .Net F#. Assessed in grades 1-10 based on quality of implementation and delivery time.
Midterm exam	15%		Ten open questions from theoretical part. Assessed in grades 1-10
Lab. Exercise 5	10 %	9 week.	Exercise with .Net C#. Assessed in grades 1-10 based on quality of implementation and delivery time.
Lab. Exercise 6	10 %	11 week.	Exercise with Unix Bash (Basic operations). Assessed in grades 1-10 based on quality of implementation and delivery time.
Synopsis	10 %	During semester	Investigation and presentation of selected OS and its security flows and issues.
Exam	15%	Session	Ten open questions theoretical part. Assessed in grades 1-10

Author	Year	Title	Number of periodical publications or publication Volume	The place of publication and publisher or online link
<b>Required reading</b>				
Silberschatz, Abraham, Galvin, Peter B., and Gagne, Greg	2010	Operating System Concepts: International Student Version		Hoboken [N.J.]: Wiley

Tanenbaum, Andrew S & Bos, Herbert	2015	Modern Operating Systems		Boston [Mass.]: Pearson
Recommended reading				
Stallings, William Walter	2018	Operating Systems: Internals and Design Principles		Harlow: Pearson
Russinovich, Mark E. Solomon, David A.	2012	Windows Internals		Redmond [Wash.]: Microsoft Press
Love, Robert.	2004	Linux Kernel Development		Indianapolis [Ind.]: Sams Publishing