Subject code	Credits
INF3029	4

Title

KOMPIUTERIŲ ARCHITEKTŪRA IR OPERACINĖS SISTEMOS

Title in English

COMPUTER ARCHITECTURE AND OPERATING SYSTEMS

Subject goal and annotation

The course aims to introduce students to the elements of modern computers, their architecture and working principals, to the basic structure and organizational principles of computer operating system, its main management functions as well as main algorithms for accomplishing these functions

Students will acquire theoretical and practical knowledge about the basis of computer organization and architecture; main processes, running in the computer (execution of commands, pipeling, input and output, etc.), appropriate devices (processor, memories, input and output devices, etc.) for processes implementation, and the principles of their design, about the structure of operating systems, process and thread planning and interprocess communication, memory management and virtual memory implementation principles, input-output management and deadlock avoidance, file system structure, security management, organizational principles of operating system user interfaces.

Prerequisites

Elementarycomputer and informationtechnology skills, the basics of programming.

Relationship between the learning outcomes of the study programme and the learning outcomes of the study subject

Learning outcomes of the study programme	Learning outcomes of the study subject	Methods for assessing the achievement of learning outcomes
3. Knowledge of basic and advanced *computer science* and its application	Identify key technological differences of different computer generations	Written exam
	Schematically represent combinational logic diagrams	Assessment of individual practical tasks
	Evaluate PC performance using MIPS and MFLOPS metrics	Assessment of individual practical tasks
	Convert numbers into computer-friendly format and perform mathematical operations using this format	Assessment of individual practical tasks
12. Analysis, design and development of *diverse software systems*.	Specify the differences of input/ output devices	Written exam
	Explain the operational principles of virtual and cache memory	Written exam
	Explain key evolution stages of operating systems	Written exam
	Describe and explain structural principles of operating systems	Written exam
	Describe and explain process, memory, input-output, file system management principles in operating systems	Written exam, essay

	Understand and be able to apply basic operating system management algorithms	Assessment of group practical tasks

Subject content

1. Command set architecture, main categories, examples. MIPS architecture.	2 h
2. Arithmetic logic unit. Numeral systems. Basic mathematical operations using 2's complement system. Computer formats to represent numerals (integer and real values) and characters.	3 h
3. Logical gates and circuits. Multiprocessor systems.	3 h
4. Memory architecture. Main memory, cache memory, processor register, virtual memory, external memory.	2 h
5. Pipeline and parallel processing. Input and output. Computer performance and evaluation metrics.	2 h
6. Operating system evolution. Process and thread planning, execution and management.	2 h
7. Process and thread planning and management.	2 h
8. Process communication. Process race conditions and means for avoiding: semaphores, event counts, messages.	4 h
9. Memory management. Virtual memory. Paging. Page replacement algorithms.	2 h
10. Input-output management.	2 h
11. Deadlock conditions and their avoidance.	2 h
12. File system structure and management..	2 h
13. OS selection.	2 h
Total:	**30 h**

Practical work contents

Practical tasks, combining individual and group work:
1. Building combinational logic diagrams.
2. PC performance evaluation using MIPS and MFLOPS metrics.
3. Number conversion into computer-friendly format and performing mathematical operations.
4. Application of basic operating system management algorithms (group work).

Evaluation of study results

Final written exam (50%), mid-term written exam (17%), assessment of practical work (33%).

Distribution of subject study hours

Lectures	30
Practical work	30
Individual studies (including studies in groups, preparation for the mid-term and final exams)	48
Total	**108**

Recommended literature

No.	Author, Title	Number of copies available		
		University library	Department reading rooms	Other libraries
	Main literature			
1.	Hennesy J.L., Patterson D.A., Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann Publishers Inc., 2004	2		

2.	Stallings W., Computer Organization and Architecture, Prentice-Hall International, Inc., 2005.	2	4	
3.	Andrew S. Tanenbaum. Modern Operating Systems, Prentice-Hall International, 2007.	3	2	
4.	Marvin Solomon. Introduction to Operating Systems, FreeTechBooks.com, 2007.	*Free access*		
Additional readings				
1.	Hennesy J.L., Patterson D.A., Computer Architecture A Quantitive Approach, Morgan Kaufmann, 2003.			
2.	A.Silberschatz, P.B.Galvin, G.Gagne. Operating System Concepts with Java. John Wiley and Sons, 2007.			

Subject prepared and coordinated by

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