Operating Systems

Course description

Basic information

Field of study : Analytical Computer Science

Path : -

Organizational unit : Faculty of Mathematics and Computer Science

Education level : first-cycle studies

Form of study : full-time studies

Study profile : general academic

Obligatory status : mandatory

Education cycle : 2022/23

Course code : UJ.WMIIANS.140.01912.22

Languages of instruction : Polish

Disciplines : Computer Science

ISCED classification : 0613 Software and applications development and analysis

USOS code : WMI.TCS.SO.OL.

Course coordinator

Jakub Kozik

Course instructor

Jakub Kozik

Period Semester 3	Form of verification of learning outcomes exam Teaching methods and hours lecture: 30 laboratory classes: 30	Number of ECTS credits 6.0

Educational aims of the course

C1	Introduction to the operating system interface defined in the POSIX standard. Developing programming skills based on this standard (POSIX programming).

C2	Understanding the basic concepts and problems related to operating system implementation, including the POSIX standard.
C3	Making students aware of the fundamental problems of concurrent programming.

Learning outcomes for the course

Code	Effects in terms of	Directional learning outcomes	Verification methods
Knowledge – The student knows and understands:			
W1	the operating system interface defined in the POSIX standard.	IAN_K1_W13	written exam, project, programming tasks
W2	principles of operating system design.	IAN_K1_W13	written exam
Skills – The student can:			
U1	analyze the advantages and disadvantages of solutions used in operating system implementation.	IAN_K1_U19	written exam, project
U2	use inter-process communication mechanisms provided by the system to implement example concurrent applications.	IAN_K1_U12	programming tasks
U3	program applications based on the POSIX standard.	IAN_K1_U12, IAN_K1_U18	project, programming tasks
U4	carry out a simple programming project involving modification/extension of an example operating system.	IAN_K1_U18	project

ECTS credits balance

Form of student activity	Average number of hours* devoted to completed types of activities
lecture	30
laboratory classes	30
project preparation	60

independent solving of computer tasks	20
exam preparation	30
exam participation	2

Total student workload	Number of hours 172	ECTS credits 6.0

* hour (lesson) means 45 minutes

Course content

No.	Course content	Learning outcomes for the course
1.	Basic operating system interface – POSIX standard – processes, files, signals.	W1, U3
2.	Concurrency and process synchronization mechanisms.	W2, U2
3.	Operating system architectures – monolithic systems, microkernel systems.	W2
4.	Process scheduling methods.	W2
5.	Analysis of the MINIX operating system microkernel implementation.	U1
6.	Input/output system – general resource management issues, deadlock avoidance/detection mechanisms, implementation of the input/output system in MINIX.	W2, U1
7.	Memory management – segmentation and paging mechanisms, implementation of memory and process management in MINIX.	W2, U1
8.	File system – types of disk space organization, MINIX file system, implementation of the file server in MINIX.	W2, U1
9.	Implementation of a programming project involving modification/extension of an example operating system	U4

Extended information

Teaching methods:

project method, multimedia presentation lecture, case studies, laboratory classes

Type of classes	Forms of credit	Course credit requirements
lecture	written exam	To pass the course, more than 50% of points on the written exam and a positive grade from the laboratory classes are required.

Type of classes	Forms of credit	Course credit requirements
laboratory classes	project, programming tasks	To pass the laboratory classes, timely and correct completion of two programming projects and two programming tasks is required. Activity during classes may improve the grade but does not change the fact of passing the classes.

Prerequisites and additional requirements

- ability to program in C language
- knowledge of the user side of a UNIX family system

Literature

Required

1. Andrew S. Tanenbaum, Systemy operacyjne, Helion 2015

Additional

1. Andrew S Tanenbaum, Albert S Woodhull, Operating Systems Design and Implementation, 3rd Edition, Pearson Prentice Hall 2009.
2. POSIX.1-2017, The Open Group Base Specifications Issue 7, 2018 edition, IEEE Std 1003.1™-2017 (Revision of IEEE Std 1003.1-2008)
3. A. Silberschatz, J.L. Peterson, G. Gagne: Podstawy systemów operacyjnych. WNT