Appendix No. 1.5 to the Resolution No. 61/2025
of the Rector of the University of Rzeszów

SYLLABUS

REGARDING THE QUALIFICATION CYCLE FROM 2026 TO 2029
ACADEMIC YEAR 2028/2029

1. BASIC COURSE/MODULE INFORMATION

Course/Module title	Operating Systems
Course/Module code *	
Faculty (name of the unit offering the field of study)	Faculty of Exact and Technical Sciences
Name of the unit running the course	Institute of Mathematics
Field of study	Mathematics
Qualification level	First-cycle studies (Bachelor's)
Profile	General academic
Study mode	Full-time
Year and semester of studies	Year 3, Semester 5
Course type	Specialisation course
Language of instruction	English
Coordinator	Paweł Pasteczka, PhD
Course instructor	Paweł Pasteczka, PhD

* - as agreed at the faculty

1.1.Learning format – number of hours and ECTS credits

Semester (no.)	Lectures	Classes	Laboratories	Seminars	Practical classes	Internships	others	**ECTS credits**
5	15		30					3

1.2. Course delivery methods
☒ traditional classroom-based instruction
☐ no distance learning / or optional use of distance learning methods and techniques

1.3. Course/Module assessment (exam, pass with a grade, pass without a grade)
Lecture – pass without a grade
Laboratory – pass with a grade

2. PREREQUISITES

Introduction to programming

3. OBJECTIVES, LEARNING OUTCOMES, COURSE CONTENT, AND INSTRUCTIONAL METHODS

3.1. Course/Module objectives

O1	Administer Linux systems: install/configure on bare metal and VMs, manage storage/filesystems/encryption, users/permissions/quotas, and monitor/troubleshoot with logs, services, and tooling.
O2	Automate operations: write robust Bash scripts using pipes, redirection, grep/awk/sed; schedule with cron; manage software via packages and source builds; apply reproducible workflows (Makefiles)
O3	Build systems software: develop C programs using system calls, processes/threads, IPC and synchronization; apply concurrency principles; containerize and run applications with Docker.

3.2. COURSE/MODULE LEARNING OUTCOMES (TO BE COMPLETED BY THE COORDINATOR)

Learning Outcome	The description of the learning outcome defined for the course/module	Relation to the degree programme outcomes
LO_01		
LO_02		

3.3. Course content (to be completed by the coordinator)

A. Lectures

Content outline
1. Installation and basic features of the operating system.
2. Distributions, installation, packages, dual boot, file system, administrator account.
3. Basic commands and their parameters, the role and management of streams, standard output and standard error.
4. Bash language: local variables, conditionals, loops, returning values, stream management, use of built-in tools (basics of grep and awk).
5. Bash language: continuation
6. /proc, /etc, selected system services (for example cron)
7. Disks, file system, disk encryption, partitions, fstab, etc.
8. Memory management.
9. Account management. Creating new accounts, permissions management, groups. Administrative accounts
10. Introduction to C: system calls, man documentation.
11. Introduction to C: continuation

12. Processes, threads, scheduler, fork, exec.
13. Introduction to concurrent programming, classic concurrency problems.
14. POSIX and IPC: signals, shared memory, semaphores, etc.
15. Multithreaded programs, mutexes, etc.

B. Classes, laboratories, seminars, practical classes

Content outline
1. Virtualization, restore points, installing the system in a virtual machine.
2. Console and basic console commands, text editor.
3. Packages, installing additional packages, management systems, building from source, Makefile
4. Bash part I
5. Bash part II
6. Bash part III
7. Partition management: fstab, encrypted partition
8. selected services: cron, logs, dmesg, stat.
9. Account management, resource management.
10. Containers: for example docker, Kubernetes.
11. Introduction to C: system calls, file descriptors.
12. Introduction to C: malloc, free, pointers.
13. Process management in C (fork, exec, kill, system, pipe, etc.)
14. POSIX and IPC
15. Multithreaded programs, mutex, etc.

3.4. Methods of Instruction

Laboratory classes: problem solving, discussion, group work.
Lectures: problem-based lecture / multimedia presentation.

4. Assessment techniques and criteria

4.1 Methods of evaluating learning outcomes

Learning outcome	Methods of assessment of learning outcomes (e.g. test, oral exam, written exam, project, report, observation during classes)	Learning format (lectures, classes,...)
LO-01	test	lectures
LO-002	colloquium, observation during classes	lectures, lab

4.2 Course assessment criteria

Lecture credit based on a test.

The condition for passing the laboratory is obtaining at least 51 percent of points possible to obtain from series of tasks. Activity during classes is rewarded with additional points. Grading scale:

- 50–59% – satisfactory (3.0)
- 60–69% – satisfactory plus (3.5)
- 70–79% – good (4.0)
- 80–89% – good plus (4.5)
- 90–100% – very good (5.0)

5. Total student workload needed to achieve the intended learning outcomes – number of hours and ECTS credits

Activity	Number of hours
Course hours	45
Other contact hours involving the teacher (consultation hours, examinations)	2
Non-contact hours - student's own work (preparation for classes or examinations, projects, etc.)	30
Total number of hours	77
Total number of ECTS credits	3

* One ECTS point corresponds to 25-30 hours of total student workload

6. Internships related to the course/module

Number of hours	*Not applicable*
Internship regulations and procedures	*Not applicable*

7. Instructional materials

Compulsory literature: 1. Michael Kerrisk, The Linux Programming Interface. No Starch Press, 2010. 2. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, UNIX and Linux System Administration Handbook (5th ed.). Addison-Wesley, 2017. 3. William Shotts, The Linux Command Line (2nd ed.). No Starch Press, 2019.
Complementary literature:

1. W. Richard Stevens, Stephen A. Rago, Advanced Programming in the UNIX Environment (3rd ed.). Addison-Wesley, 2013.
2. Nigel Poulton, Docker Deep Dive (4th ed.). Leanpub, 2023.
3. Brian Ward, How Linux Works (3rd ed.). No Starch Press, 2021.

Approved by the Head of the Department or an authorised person