

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>Babeş-Bolyai University</b>
1.2 Faculty	<b>Faculty of Mathematics and Computer Science</b>
1.3 Department	<b>Department of Computer Science</b>
1.4 Field of study	<b>Mathematics</b>
1.5 Study cycle	<b>Bachelor</b>
1.6 Study programme / Qualification	<b>Mathematics and Computer Science - English</b>

### 2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)	<b>Operating Systems</b> Sisteme de Operare						
2.2 Course coordinator	<b>Assoc. Prof. PhD. Sanda-Maria Avram</b>						
2.3 Seminar coordinator	<b>Assoc. Prof. PhD. Sanda-Maria Avram</b>						
2.4. Year of study	<b>2</b>	2.5 Semester	<b>4</b>	2.6. Type of evaluation	<b>E</b>	2.7 Type of discipline	<b>mandatory</b>
2.8 Code of the discipline	<b>MLE5007</b>						

### 3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	<b>4</b>	Of which: 3.2 course	<b>2</b>	3.3 seminar/laboratory	<b>2</b>
3.4 Total hours in the curriculum	<b>56</b>	Of which: 3.5 course	<b>28</b>	3.6 seminar/laboratory	<b>28</b>
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					13
Additional documentation (in libraries, on electronic platforms, field documentation)					8
Preparation for seminars/labs, homework, papers, portfolios and essays					9
Tutorship					7
Evaluations					7
Other activities: .....					
3.7 Total individual study hours	<b>44</b>				
3.8 Total hours per semester	<b>100</b>				
3.9 Number of ECTS credits	<b>4</b>				

### 4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	<ul style="list-style-type: none"> <li>• Basic programming skills in C standard.</li> </ul>

### 5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> <li>• A lecture class with video projector.</li> </ul>
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> <li>• Laboratory with computers connected to the Internet and UNIX/ LINUX-like operating systems or access to an UNIX/LINUX server.</li> </ul>

### 6. Specific competencies acquired

<b>Professional competencies</b>	Identify basic concepts and models for computer systems.
	Identify and explain the basic architecture for the organization and management systems.
	Use techniques for installation, configuration and systems management.
<b>Transversal competencies</b>	Applying organized and efficient work rules, the responsible attitudes of the teaching-scientific, for harnessing creative potential, the principles and rules of professional ethics.
	The use of effective learning methods and techniques, information, research and capacity to exploit the knowledge to adapt to a dynamic society and communication in Romanian and in an international language.

### 7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>• Uptake of the learner on the main concepts underlying operating systems.</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>• Acquiring main facilities offered by the UNIX operating systems.</li> <li>• Acquiring skills in shell programming and processing text files under UNIX.</li> <li>• Management of multitasking applications using UNIX processes.</li> </ul>

### 8. Content

8.1 Course	Teaching methods	Remarks
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<p>1-3 Unix OS: external interfaces</p> <ul style="list-style-type: none"> <li>- The general structure of an operating system</li> <li>- Regular expressions to specify files; generic specification</li> <li>- Filters; general principles: sort, awk, sed, grep</li> <li>- Unix Shells: sh, csh, ksh, bash; overview</li> <li>- Useful Shell commands and external processes management</li> <li>- Shell programming;</li> <li>- The structure of directories in Unix system</li> <li>- The mount-ing concept</li> <li>- Symbolic and hard links</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>4-7 Unix operating system: system calls, internal structures</p> <ul style="list-style-type: none"> <li>- Files and processes under Unix</li> <li>- I / O using handle: open, close, lseek, read, write, after, dup2</li> <li>- File Protection</li> <li>- Processes in Unix; process structure</li> <li>- Calls process management system: fork, wait, exit, exec *</li> <li>- Communications between processes: pipe, popen, FIFO</li> <li>- POSIX Threads</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
<p>8-9 Filesystems</p> <ul style="list-style-type: none"> <li>- General management issues disk and file systems</li> <li>- Planning disk access</li> <li>- The internal structure of the disk and DOS file system; FAT</li> <li>- The internal structure of the disk and file system Windows NT &amp; 2000; NTFS mechanism, MFT file</li> <li>- The internal structure of the disk and Unix file system; i-node mechanism</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	

<p>10-14 General Theory of operating systems</p> <ul style="list-style-type: none"> <li>- Types of computers and operating systems. Classifications</li> <li>- I/O Channel, multiple buffers. Multiprogramming.</li> <li>- General structure and functions of an operating system</li> <li>- The concept of process: specification, competition, semaphores, deadlock</li> <li>- Process Scheduling</li> <li>- Problems with memory management</li> <li>- Planning exchange between the internal memory and secondary</li> </ul>	<p>Exposure: description, explanation, examples, discussion of case studies</p>	
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## Bibliography

### In English:

1. **Albing, C., Vossen, J.P., Newhman, C.**, bash Cookbook: Solutions and Examples for bash Users, O'Reilly, USA, 2007.
2. **Kernighan, B.W., Dennis, R.M.**, The C Programming Language, Prentice Hall, Massachusetts, 2012.
3. **Stallings, W.**, Operating Systems: Internals and Design Principles, Pearson Education Limited, Essex, 2015.
4. **Raymond, E.S.**, The Art of UNIX Programming, Addison-Wesley, Pearson Education Limited, USA, 2004.
5. **Tanenbaum, A., Herbert, B.**, Modern Operating Systems, Pearson Education Limited, Essex, 2015.

### In Romanian:

6. **Boian, F., Vancea, A., Boian, R., Bufnea, D., Sterca, A., Cobarzan, C., Cojocar, D.**, Sisteme de operare, Ed. Risoprint, Cluj-Napoca, 2006.

8.2 Seminar / laboratory	Teaching methods	Remarks
1-2. Unix commands for working with files	Dialogue, debate, case studies, examples, proofs	
3. Shell 1	Dialogue, debate, case studies, examples, proofs	
4. sed and grep utilities	Dialogue, debate, case studies, examples, proofs	
5. awk utility	Dialogue, debate, case studies, examples, proofs	
6. shell Programs	Dialogue, debate, case studies, examples, proofs	

7-8. C programs; working with Unix files	Dialogue, debate, case studies, examples, proofs	
9. UNIX Processes	Dialogue, debate, case studies, examples, proofs	
10. Communications between Unix processes: pipe	Dialogue, debate, case studies, examples, proofs	
11. Communications between Unix processes: FIFO	Dialogue, debate, case studies, examples, proofs	
12. Unix-Threads	Dialogue, debate, case studies, examples, proofs	
13. Closing lab activities	Dialogue, debate, case studies, examples, proofs	
14. Practical exam	Dialogue, debate, case studies, examples, proofs	
Bibliography		
In English:		
<ol style="list-style-type: none"> <li>1. <b>Albing, C., Vossen, J.P., Newhman, C.</b>, bash Cookbook: Solutions and Examples for bash Users, O'Reilly, USA, 2007.</li> <li>2. <b>Kernighan, B.W., Dennis, R.M.</b>, The C Programming Language, Prentice Hall, Massachusetts, 2012.</li> <li>3. <b>Raymond, E.S.</b>, The Art of UNIX Programming, Addison-Wesley, Pearson Education Limited, USA, 2004.</li> </ol>		
In Romanian:		
<ol style="list-style-type: none"> <li>4. <b>Boian, F., Vancea, A., Boian, R., Bufnea, D., Sterca, A., Cobarzan, C., Cojocar, D.</b>, Sisteme de operare, Ed. Risoprint, Cluj-Napoca, 2006.</li> </ol>		

**9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program**

- This course exists in the curriculum in all major universities in Romania and abroad.
- This course provides the basic knowledge that any administrator or developer must possess.

**10. Evaluation**

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course			
	- know the basic principle of the domain	Final exam	40%
10.5 Seminar/lab activities	- application of these concepts in solving problems	Lab assignments	20%
	- writing shells and creating Unix processes	Practical exam	40%
10.6 Minimum performance standards			
➤ At least grade 5 (from a scale of 1 to 10) for all types of examination.			

Date

Signature of course coordinator

Signature of seminar coordinator

04.05.2020

Assoc.Prof.PhD. Sanda-Maria Avram

Assoc.Prof.PhD. Sanda-Maria Avram

Date of approval

Signature of the head of department

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Lecturer. Dr. Adrian STERCA