

## SYLLABUS

### 1. Information regarding the programme

1.1 Higher education institution	<b>Babes-Bolyai University</b>
1.2 Faculty	<b>Mathematics and Informatics</b>
1.3 Department	<b>Informatics</b>
1.4 Field of study	<b>Informatics</b>
1.5 Study cycle	<b>Licence</b>
1.6 Study programme / Qualification	<b>Informatics - english</b>

### 2. Information regarding the discipline

2.1 Name of the discipline	<b>Operating Systems</b>						
2.2 Course coordinator	<b>Assoc. prof. Rares Boian</b>						
2.3 Seminar coordinator	<b>Assoc. prof. Rares Boian</b>						
2.4. Year of study	<b>1</b>	2.5 Semester	<b>2</b>	2.6. Type of evaluation	<b>E</b>	2.7 Type of discipline	<b>Mandatory</b>

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

3.1 Hours per week	5	Of which: 3.2 course	2	3.3 seminar/laboratory	3
3.4 Total hours in the curriculum		Of which: 3.5 course	28	3.6 seminar/laboratory	42
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					25
Additional documentation (in libraries, on electronic platforms, field documentation)					15
Preparation for seminars/labs, homework, papers, portfolios and essays					30
Tutorship					15
Evaluations					9
Other activities: .....					-
3.7 Total individual study hours			94		
3.8 Total hours per semester			150		
3.9 Number of ECTS credits			5		

### 4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

### 5. Conditions (if necessary)

5.1. for the course	
5.2. for the seminar /lab activities	

## 6. Specific competencies acquired

<b>Professional competencies</b>	<ul style="list-style-type: none"> <li>• Define notions, concepts, theories and models of basic operating systems.</li> <li>• Critical analysis and use of the principles, methods and techniques work for quantitative and qualitative evaluation of the processes within an operating system and communication mechanisms between its processes</li> <li>• Apply basic concepts and theories in the field of computer architecture, programming methods and operating systems project development professional</li> <li>• Ability to solve problems for low-level interface on OS kernels</li> </ul>
<b>Transversal competencies</b>	<ul style="list-style-type: none"> <li>• • Execution of the tasks required under specified requirements and the deadlines imposed, with the rules of professional ethics and moral conduct</li> <li>• • Information and permanent documentation in its field</li> <li>• • seeking to improve business results by engaging in professional activities</li> </ul>

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> <li>• • Learning the main entities and concepts that operates in operating systems: processes and files.</li> <li>• The base station processes the binding of files and communication between processes.</li> <li>• learning programming bases specific operating systems: type scripting language programming (sh, bash, PowerShell, Python) and use system functions in standard C language.</li> <li>• Presentation of the case studies, the enitator, concepts and APIs operating processes provided by the Unix family of operating systems (Solaris, Linux, BSD, etc</li> </ul>
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> <li>• • Unix operating system: introduction.</li> <li>• Programming Shell.</li> <li>• Windows Introduction: bat file commands</li> <li>• Unix file system: tree structure and connections.</li> <li>• Unix Operating System I / O, processes signals.</li> <li>• Communication between Unix processes.</li> <li>• Installation and configuration of operating systems</li> </ul>

## 8. Content

8.1 Course	Teaching methods	Remarks
Week. 1 Unix: Introduction. <ul style="list-style-type: none"> <li>• Unix commands and arguments.</li> <li>• Regular Expression, generic specification of files.</li> <li>• Filters and text editors.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 2 Shell Programming. <ul style="list-style-type: none"> <li>• Sh Processors.</li> <li>• Variables, control structures (if, for, while, do, case).</li> <li>• Embedded commands.</li> <li>• Remarkable shell variables.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	

Sapt. 3. Windows: introduction. <ul style="list-style-type: none"> <li>• Commands and arguments.</li> <li>• Files and paths; Access rights</li> <li>• Command bat files</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 4 OS Unix: processes. <ul style="list-style-type: none"> <li>• Unix processes; structure, API (fork, wait, exec, exit, system, popen).</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 5 POSIX Threads <ul style="list-style-type: none"> <li>• Concepts.</li> <li>• API: create, exit, join.</li> <li>• Mutex variables.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 6 Unix File System; I/O operations. <ul style="list-style-type: none"> <li>• Hard and symbolic links.</li> <li>• Mounting.</li> <li>• File access rights</li> <li>• open, close, read, write, lseek, file lock.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 7 General Theory of Operating Systems <ul style="list-style-type: none"> <li>• Classifications.</li> <li>• Functions</li> <li>• Architectures.</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Sapt. 8 Processes. <ul style="list-style-type: none"> <li>• Concepts</li> <li>• Concurrence.</li> <li>• Semaphores.</li> <li>• Critical sections and race conditions</li> <li>• Deadlock.</li> <li>• Processes scheduling</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Săpt. 9 Memory management <ul style="list-style-type: none"> <li>• Architecture</li> <li>• Alocatiopns: partitioned, paging, segmentation.</li> <li>• Swapping</li> <li>• Memory scheduling</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Săpt. 10 Physical I/O <ul style="list-style-type: none"> <li>• I/O chanel</li> <li>• Zone tampon.</li> <li>• Disk access scheduling</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Săpt. 11 File Systems <ul style="list-style-type: none"> <li>• Concepts</li> <li>• Low-level implementations.</li> <li>• Directories</li> <li>• Jurnalization; copy-on-write</li> <li>• Example: FAT, EXT3, NTFS</li> </ul>	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical demonstration</li> </ul>	
Săpt. 12 Operating systems booting	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> <li>• Didactical</li> </ul>	

	demonstration	
Săpt. 13 Linux kernel	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> <li>● Didactical demonstration</li> </ul>	
Săpt. 14 Windows kernel	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> <li>● Didactical demonstration</li> </ul>	

### Bibliography

1. ALBING C., VOSSEN J.P., NEWHAM C. bash Cookbook. O'Reilly, 2007
2. BOIAN F, VANCEA A. BOIAN R. BUFNEA D., STERCA A., COBARZAN C., COJOCAR D. Sisteme de operare Ed. Risoprint, 2006.
3. BOIAN F.M. De la aritmetica la calculatoare. Ed. Presa Universitara Clujeana, Cluj, 1996.
4. BOIAN F.M. FERDEAN C.M., BOIAN R.F., DRAGOS R.C. Programare concurentă pe platforme Unix, Windows, Java. Ed. Albastră, grupul Microinformatica, Cluj, 2002.
5. BOIAN F.M. Servicii web; modele, platforme, aplicații. Ed. Albastră - grupul Microinformatica, Cluj, 2012
6. LUTZ M. Learning Python. O'Reilly, 2009.
7. RAYMOND E.S. The Art of Unix Programming. Prentice Hall, 2003.
8. STALLINGS W. Operating Systems: Internal and Design Principles. 6th edition, Prentice Hall, 2009.
9. TANENBAUM A.S. Modern Operating Systems. 3rd edition, Prentice Hall, 2009
10. Ubuntu - The Complete Reference. Richard Petersen, MCGraw-Hill, 2009

Windows 7 User Guide. Microsoft, 2009

8.2 Seminar / laboratory	Teaching methods	Remarks
Unix: commands and text editors	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul> Didactical demonstration	
sed, grep, awk	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul> Didactical demonstration	
Shell program	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul> Didactical demonstration	
C program under Unix using gcc	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul> Didactical demonstration	
Windows bat	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul> Didactical demonstration	
Unix processes	<ul style="list-style-type: none"> <li>● Interactive exposure</li> <li>● Explanation</li> <li>● Conversation</li> </ul>	

	Didactical demonstration	
Unix threads	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul> Didactical demonstration	
Unix; thread + mutex	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul> Didactical demonstration	
Windows processes	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul> Didactical demonstration	
Windows threads	<ul style="list-style-type: none"> <li>• Interactive exposure</li> <li>• Explanation</li> <li>• Conversation</li> </ul> Didactical demonstration	

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11. ALBING C., VOSSEN J.P., NEWHAM C. bash Cookbook. O'Reilly, 2007
12. BOIAN F, VANCEA A. BOIAN R. BUFNEA D., STERCA A., COBARZAN C., COJOCAR D. Sisteme de operare Ed. Risoprint, 2006.
13. BOIAN F.M. De la aritmetica la calculatoare. Ed. Presa Universitara Clujeana, Cluj, 1996.
14. BOIAN F.M. FERDEAN C.M., BOIAN R.F., DRAGOS R.C. Programare concurentă pe platforme Unix, Windows, Java. Ed. Albastră, grupul Microinformatica, Cluj, 2002.
15. BOIAN F.M. Servicii web; modele, platforme, aplicații. Ed. Albastră - grupul Microinformatica, Cluj, 2012
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17. RAYMOND E.S. The Art of Unix Programming. Prentice Hall, 2003.
18. STALLINGS W. Operating Systems: Internal and Design Principles. 6th edition, Prentice Hall, 2009.
19. TANENBAUM A.S. Modern Operating Systems. 3rd edition, Prentice Hall, 2009
20. Ubuntu - The Complete Reference. Richard Petersen, MCGraw-Hill, 2009  
Windows 7 User Guide. Microsoft, 2009

### 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

- By learning the theoretical and methodological concepts and addressing practical discipline included in operating systems, students acquire a body of knowledge consistent, consistent with partial competencies required for possible occupations provided in Grid 1 - RNCIS
- The course complies with IEEE and ACM Curricula Recommendations for Computer Science studies.
- The course curriculum exists in universities and faculties in Romania
- The course content is very well appreciated by software companies whose employees and graduates of this course

### 10. Evaluation

Tip activitate	10.1 Criterii de evaluare	10.2 metode de evaluare	10.3 Pondere din nota finală
10.4 Curs	Înșușirea și înțelegerea corectă a problematicei tratate la curs	Examen scris în timpul sesiunii	40%

	Rezolvarea corectă a problemelor		
10.5 Seminar/laborator	Abilitatea de a rezolva probleme practice specifice cursului, direct la calculator și în timp limitat	Examen practic în ultimele 2 săptămâni ale semestrului	30 %
	Activitatea desfășurată în laborator	Colocviu în ultimele 2 săptămâni ale semestrului	30%
10.6 Standard minim de performanță			
<ul style="list-style-type: none"> <li>• Minimum nota 5 la fiecare dintre cele trei probe: examen scris, examen practic, activitatea de laborator</li> </ul>			

Date

10.05.2014

Date of approval

Signature of course coordinator

Conf. dr. Rares Boian

Signature of seminar coordinator

Conf. dr. Rares Boian

Signature of the head of department