SYLLABUS

1. Information regarding the programme

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

2. Information regarding the discipline

2.1 Name of the discipline	**Parallel and Distributed Programming**						
2.2 Course coordinator	**Prof. dr. Florian Boian**						
2.3 Seminar coordinator	**Prof. dr. Florian Boian**						
2.4. Year of study	**2**	2.5 Semester	**5**	2.6. Type of evaluation	**E**	2.7 Type of discipline	**Mandatory**

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	70	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	6

4. Prerequisites (if necessary)

4.1. curriculum	
4.2. competencies	

5. Conditions (if necessary)

5.1. for the course	• The specific requirements of the course, as those of laboratory work are posted at: a http://www.cs.ubbcluj.ro/ ~ florin / PPD
5.2. for the seminar /lab activities	• Laboratoare cu acces la sisteme de operare Unix şi Windows, cu acces individual pe bază de user şi parolă

	• Cerintele specifice cursului, ca şi cele ale activităţii de laborator sunt postate la: http://www.cs.ubbcluj.ro/~florin/PPD

6. Specific competencies acquired

Professional competencies	• Define notions, concepts, theories and models to core parallel programming concurrent and distributed. • Critical analysis and use of the principles, methods and techniques of quantitative and qualitative evaluation work processes and communication between them, the prospects for parallel programming concurrent and distributed. • Apply basic concepts and theories of multiprocessor computer architecture, programming methods and operating systems project development professional • Ability to solve problems through negotiations coopperare between processes operating on different platforms connected by unreliable channels
Transversal competencies	• Execution of the tasks required under specified requirements and the deadlines imposed, with the rules of professional ethics and moral conduct • Information and documentation in the field of activity continuously in Romanian and English • seeking to improve business results by engaging in professional activities

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

7.1 General objective of the discipline	• Learning the main entities and concepts that operates in the context of parallel programming, concurrent and distributed. • The base communication between processes and threads, located on acceeaşi machine or remote machines. • Acquiring specific bases parallel programming concurrent and distributed • Case studies and developing multiplatform projects, with examples on Unix and Windows
7.2 Specific objective of the discipline	• non-sequential programming paradigms: parallel programming, concurrent programming, distributed programming, similarities and differences • parallel architectures and parallel programming systems • competing systems: communication and synchronization between processes that evolve simultaneously • Distributed systems and middleware technologies for distributed implementations • RPC paradigm • Management of distributed processes • distributed shared memory • Distributed File Systems

8. Content

8.1 Course	Teaching methods	Remarks
Week. 1 Nonsequential programming paradigms: • Parallel programming • Concurrent programming	• Interactive exposure • Explanation • Conversation	

• Distribuited programming • Comparing these paradigms • Granularitaty levels	• Didactical demonstration	
Week. 2 Paralel architectures. • Pipeline • Vectorial machines • Grid and cluster systems • Supercalcomputing	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 3-4 Develop GPU applications • Architecture; NVIDIA platforms • API; CUDA model. • OpenCL	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 5 Parallel programming with gid and cluster	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 6 Parallel evaluation and sequential programs transformations • Expressions • Sequences of assignments • FOR - LOOP	• Interactive exposure • Explanation • Conversation • Didactical demonstration	

Week. 7 - 8 Concurrent systems
• Concepts
• Inter-process communications:
  ○ pipe and FIFO
  ○ shared memory
  ○ message queues
• Sincronizations:
• semaphores
• mutex variables
• conditional variables
• reader-writter
• bariers
	• Interactive exposure
	• Explanation
	• Conversation
	• Didactical demonstration	

Week. 9-10 Distribuited systems and middleware technologies • RPC • High-level RPC • Low-level RPC • Generating RPC	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 11 Distributed objects • RMI • Pyro • CORBA • Web services	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 12 Managements of distributed processes	• Interactive exposure • Explanation • Conversation • Didactical demonstration	
Week. 13 Distributed shared memory	• Interactive exposure	

	• Explanation • Conversation • Didactical demonstration	
Week. 14 Distributed fyle systems	• Interactive exposure • Explanation • Conversation • Didactical demonstration	

Bibliography

1. BACON J. Concurrent Systems: Operating Systems, Database and Distributed Systems - an integrated approach. Addison-Wesley, 1998
2. BOIAN F.M. Programare distribuita în Internet; metode si aplicatii. Ed. Albastra, grupul Microinformatica, Cluj, 1997
3. BOIAN F.M. FERDEAN C.M., BOIAN R.F., DRAGOS R.C. Programare concurenta pe platforme Unix, Windows, Java. Ed. Albastra, grupul Microinformatica, Cluj, 2002
4. BOIAN F.M.Servicii web;modele, platforme, aplicaţii. Ed. Albastră - grupul Microinformatica, Cluj, 2012
5. IGNAT I. KACSO A. Unix: generarea proceselor. Ed. Albastra, grupul Microinformatica, Cluj, 1995
6. MATLOFF N.S. Programming on parallel Machines, Univ. of California Davis Press
7. SINNEN O. Task Scheduling for Parallel Systems, Willey, 2007
8. STALLINGS W. Operating Systems: Internal and Design Principles. Prentice Hall, 1998.
9. TANENBAUM A.S. Distributed Operating Systems. Prentice Hall, 2005
10. TARI Z., BUKHRES O. Fundamentals of Distributed Object Systems. Willey, 2001
11. Ubuntu - The Complete Reference; Richard Petersen MCGraw-Hill, 2009

Windows 7 User Guide. Microsoft, 2009

8.2 Seminar / laboratory	Teaching methods	Remarks
Open CL, architecture and programming	• Interactive exposure • Explanation • Conversation Didactical demonstration	
MPI introduction	• Interactive exposure • Explanation • Conversation Didactical demonstration	
Paralel programming project	• Interactive exposure • Explanation • Conversation Didactical demonstration	
Concurrent programming in Unix	• Interactive exposure • Explanation • Conversation Didactical demonstration	
Concurrent programming in Windows	• Interactive exposure • Explanation • Conversation Didactical demonstration	
Concurrent programming project	• Interactive exposure • Explanation • Conversation Didactical demonstration	
CORBA examples	• Interactive exposure	

	• Explanation • Conversation Didactical demonstration	
RMI and Pyro examples	• Interactive exposure • Explanation • Conversation Didactical demonstration	
Distributed programing project	• Interactive exposure • Explanation • Conversation Didactical demonstration	

Bibliography

1. BACON J. Concurrent Systems: Operating Systems, Database and Distributed Systems - an integrated approach. Addison-Wesley, 1998
2. BOIAN F.M. Programare distribuita în Internet; metode si aplicatii. Ed. Albastra, grupul Microinformatica, Cluj, 1997
3. BOIAN F.M. FERDEAN C.M., BOIAN R.F., DRAGOS R.C. Programare concurenta pe platforme Unix, Windows, Java. Ed. Albastra, grupul Microinformatica, Cluj, 2002
4. BOIAN F.M.Servicii web;modele, platforme, aplicaţii. Ed. Albastră - grupul Microinformatica, Cluj, 2012
5. IGNAT I. KACSO A. Unix: generarea proceselor. Ed. Albastra, grupul Microinformatica, Cluj, 1995
6. MATLOFF N.S. Programming on parallel Machines, Univ. of California Davis Press
7. SINNEN O. Task Scheduling for Parallel Systems, Willey, 2007
8. STALLINGS W. Operating Systems: Internal and Design Principles. Prentice Hall, 1998.
9. TANENBAUM A.S. Distributed Operating Systems. Prentice Hall, 2005
10. TARI Z., BUKHRES O. Fundamentals of Distributed Object Systems. Willey, 2001
11. 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 Curriculla 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	Insuşirea şi înţelegerea corectă a problematicii tratate la curs. Rezolvarea corectă a problemelor	Lucrare de control: programare paralelă Lucrare de control: programare concurentă Lucrare de control: programare distribuită	25% 25% 25%
10.5 Seminar/laborator	Activitatea desfăşurată în laborator	Colocviu în ultimele 2 săptămâni ale semestrului	25 %
10.6 Standard minim de performanţă			

- Minimum nota 5 la fiecare dintre cele patru probe: examen scris, examen practic, activitatea de laborator

Date	Signature of course coordinator	Signature of seminar coordinator
10.05.2014	Prof. dr. Florian Mircea Boian	Prof. dr. Florian Mircea Boian

Date of approval

Signature of the head of department