SYLLABUS

1. Date despre program

1.1 Higher education institution	Babeş Bolyai University
1.2 Faculty	Faculty of Mathematics and Computer Science
1.3 Department	Department of Computer Science
1.4 Field of study	Computer Science
1.5 Study cycle	Master
1.6 Study programme / Qualification	Distributed Systems in Internet

2. Information regarding the discipline

2.1 Name of the discipline	Grid, Cluster and Cloud Computing						
2.2 Course coordinator	PhD Assoc. Prof. Darabant Sergiu Adrian						
2.3 Seminar coordinator	PhD Assoc. Prof. Darabant Sergiu Adrian						
2.4. Year of study	1	2.5 Semester	2	2.6. Type of evaluation	E	2.7 Type of discipline	Optional

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

3.1 Hours per week	4	Of which: 3.2 course	2	3.3 seminar/laboratory	1 sem + 1 pr
3.4 Total hours in the curriculum	56	Of which: 3.5 course	28	3.6 seminar/laboratory	28
Time allotment:					Hours
Learning using manual, course support, bibliography, course notes					20
Additional documentation (in libraries, on electronic platforms, field documentation)					20
Preparation for seminars/labs, homework, papers, portfolios and essays					50
Tutorship					9
Evaluations					20
Other activities:					0

3.7 Total individual study hours	119
3.8 Total hours per semester	175
3.9 Number of ECTS credits	7

4. Prerequisites (if necessary)

4.1. curriculum	• Operating Systems, Computer Networks
4.2. competencies	• Average to good knowledge of Java and .NET programming.

5. Conditions (if necessary)

5.1. for the course	• Classroom with Internet Connection and Cloud test infrastructure for: Amazon, Microsoft and faculty own private cloud.
5.2. for the seminar /lab	• Laboratory with Internet connected computers. Possibility to run virtualization solutions

6. Specific competencies acquired

Professional competencies	• Ability to design and implement parallel methods for solving complex problems with large input data using the Cloud based programming paradigms • Ability to apply different parallelization paradigms • Acquire theoretical and practical knowledge on grid and cloud environments.
Transversal competencies	• Ability to continuously learn, understand and apply the most recent research results in computer science. • Ability to work independently and/or in a team in order to solve problems in defined professional contexts

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

7.1 General objective of the discipline	• Be able to understand and use the theory and basic applications on Grid, Cluster and especially cloud computing.
7.2 Specific objective of the discipline	• Acquire of the main skills and abilities to work with scalable systems that allow solving large problems by dividing them in parallel sub problems, or by dividing the input data and process it in parallel bulks. • Acquire the fundamental knowledge that allows parallelizing and solving large and complex problems on scalable systems. • Acquire the necessary knowledge for operating a virtualized cloud platform

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction: definitions, roles, taxonomies	Exposure: description, explanation, examples, discussion of case studies	
2. Distributed Processing versus parallel processing	Exposure: description, explanation, examples, discussion of case studies	
3. Hardware architecture, protocols and cloud/cluster technologies.	Exposure: description, explanation, examples, discussion of case studies	
4. Virtualization technologies.	Exposure: description, explanation, examples, discussion of case studies	
5. Concurrent and parallel programming : advantages	Exposure: description,	

and pitfalls	explanation, examples, discussion of case studies	
6. Map-Reduce	Exposure: description, explanation, examples, discussion of case studies	
7. Hadoop. Distributed Filesystems: HDFS. Architecture and features.	Exposure: description, explanation, examples, discussion of case studies	
8. HBase	Exposure: description, explanation, examples, discussion of case studies	
9. Hadoop Test Environment setup. Developing applications on Hadoop.	Exposure: description, explanation, examples, discussion of case studies	
10. Microsoft Azure: fundamental concepts. Windows Azure service model.	Exposure: description, explanation, examples, discussion of case studies	
11 Worker Roles. Web Roles, SQL Azure. Message Queues. Blobs	Exposure: description, explanation, examples, discussion of case studies	
12. Cloud database systems.	Exposure: description, explanation, examples, discussion of case studies	
13. Amazon Web Services	Exposure: description, explanation, examples, discussion of case studies	
14. Eucalyptus. Google App Engine, 10gen.	Exposure: description, explanation, examples, discussion of case studies	

Bibliography

1. G. Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, O'Reilly, 2009, ISBN:978-0-596-15636-7
2. Chris Hay, Brian H Prince, Azure in Action, Manning Publication, 2011.
3. Tom White, Hadoop: The Definitve Guide, O'Reilly, ISBN: 978-0-596-52197-4, 2011
4. Jimmy Lin, Chris Dyer, Data-Intensive Text Processing with MapReduce, Morgan and Claypool Publishers, ISBN-10: 1608453421, 2010.
5. Foster, Ian; Carl Kesselman (1999). The Grid: Blueprint for a New Computing Infrastructure. Morgan Kaufmann Publishers. ISBN 1-55860-475-8
6. Li, Maozhen; Mark A. Baker (2005). The Grid: Core Technologies. Wiley. ISBN 0-470-09417-6
7. Anil Desay, The Definitive Guide to Virtual Platform Management, 2010, Ca technologies, download http://nexus.realtimepublishers.com/dgvpm.php
8. R. Jennings, Cloud Computing with the Windows Azure Platform (Wrox Programmer to Programmer), Wrox, 2009, ISBN: 978-0470506387
9. D. Sanderson, Programming Google App Engine Build and Run Scalable Web Apps on Google's Infrastructure, O'Reilly, 2009., ISBN:978-0-596-52272-8
10. Andy Oram (ed), Peer-to-peer Harnessing the power of disruptive technologies, O'Reilly, 2001, ISBN: 978-0596001100
11. * * *, http://code.google.com/intl/ro-RO/appengine/docs/

8.2 Seminar/Laboratory	Teaching methods	Remarks
1. Concurrent programming	Explanation, debate, dialogue, case studies, example, proofs	
2. Virtualization Environments: VMWare. HyperV. Configuration and setup.	Explanation, debate, dialogue, case studies, example, proofs	

3. Hadoop Virtual Machine configuration. HDFS and Hadoop services Initialization.	Explanation, debate, dialogue, case studies, example, proofs	
4. Developping Hadoop applications using the Hadoop Eclipse Pug-in	Explanation, debate, dialogue, case studies, example, proofs	
4. Microsoft Azure: Web Services	Explanation, debate, dialogue, case studies, example, proofs	
6. Azure: worker roles, blobs, message queues.	Explanation, debate, dialogue, case studies, example, proofs	
7. SQL Azure, HBase.	Explanation, debate, dialogue, case studies, example, proofs	

Bibliography

1. Chris Hay, Brian H Prince, Azure in Action, Manning Publication, 2011.
2. Tom White, Hadoop: The Definitve Guide, O'Reilly, ISBN: 978-0-596-52197-4, 2011
3. Jimmy Lin, Chris Dyer, Data-Intensive Text Processing with MapReduce, Morgan and Claypool Publishers, ISBN-10: 1608453421, 2010.

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

- The course respects the IEEE and ACM Curriculla Recommendations for Computer Science studies;
- The course exists in the studying program of all major universities in Romania and abroad;
- The content of the course covers the most important aspects necessary for applying the cloud technologies into a production environment or for solving real problems in a company.

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; - apply the course concepts - problem solving	Written exam/Paper presentation	50%
10.5 Seminar/lab activities	- be able to implement course concepts and algorithms Semester Project: developping a Hadoop and an Azure application on a defined problem.	Semester project Evaluation	50%
10.6 Minimum performance standards			
• At least grade 5 (from a scale of 1 to 10) at both written exam and laboratory work.			

Date Signature of course coordinator Signature of seminar coordinator

..03/05/2020.. Assoc Prof Adrian Sergiu DARABANT PhD Assoc Prof Adrian Sergiu DARABANT

Date of approval Signature of the head of department

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