

SYLLABUS / FIȘA DISCIPLINEI
1. Information on the study programme / Date despre programul de studii

1.1. Institution / Instituția de învățământ superior	Universitatea de Vest din Timișoara
1.2. Faculty / Facultatea	Matematică și Informatică
1.3. Department / Departamentul	Computer Science (Informatică)
1.4. Study program field	Computer Science (Informatică)
1.5. Study cycle/ Ciclul de studii	MSc / master
1.6. Study programme / Programul de studii / calificarea*	Artificial Intelligence and Distributed Computing

2. Information on the course / Date despre disciplină

2.1. Title of the course / Denumirea disciplinei		Distributed Systems			
2.2. Teacher in charge of the course / Titularul activităților de curs		Conf. Dr. Marc Eduard Frincu			
2.3. Teacher in charge of the seminar / Titularul activităților de seminar		Conf. Dr. Marc Eduard Frincu			
2.4. Study year / Anul de studii	1	2.5. Semester / Semestrul	1	2.6. Examination type / Tipul de evaluare: E(xam)	2.7. Course type / Regimul disciplinei: M(andatory)

3. Estimated study time (number of hours per semester) / Timpul total estimat (ore pe semestru al activităților didactice)

3.1. Attendance hours per week / Număr de ore pe săptămână	3	out of which din care: 3.2 lecture/ curs	2	3.3. seminar/laborator	1
3.4. Attendance hours per semester / Total ore din planul de învățământ	42	out of which: 3.5 lecture / curs	28	3.6. seminar/laborator	14
Distribution of the allocated amount of time / Distribuția fondului de timp*					hours/ore
Individual study /Studiu după manual, suport de curs, bibliografie și notițe					20
Supplementary documentation at library or using electronic repositories / Documentare suplimentară în bibliotecă, pe platformele electronice de specialitate					15
Preparing for laboratories, homework, reports etc. /Pregătire seminarii/laboratoare, teme, referate, portofolii și eseuri					40
Exams / Examinări					10
Tutoring / Tutorat					5
3.7. Total number of hours of individual study / Total ore studiu individual	90				
3.8. Total number of hours per semester / Total ore pe semestru	132				
3.9. Number of credits (ECTS)	6				

/ Număr de credite	
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4. Prerequisites (if it is the case) / Preconțiții (acolo unde e cazul)

4.1. curriculum / de curriculum	Web technologies, programming, computer networks
4.2. skills / de competențe	Algorithmics, analytical thinking, ability to use Internet sources

5. Requirements (if it is the case) / Conțiții (acolo unde e cazul)

5.1. for the lecture / de desfășurare a cursului	Lecture room with projector and whiteboard
5.2. for the seminar, laboratory / de desfășurare a seminarului/laboratorului	- Lab with computers that have access to cloud infrastructures: Eucalyptus/ OpenStack, Hadoop/ MapReduce - Java installed on machines

6. Acquired skills / Competențe specifice acumulate

Professional skills / Competențe profesionale	<ul style="list-style-type: none"> • Knowledge of distributed systems' principles and design problems • Knowledge of distributed systems' platforms, tools, and applications
Transversal skills / Competențe transversale	<ul style="list-style-type: none"> • Ability to reason the pros and cons of various technologies • Ability to extract and analyze scientific information

7. Objectives of the course / Obiectivele disciplinei (reieșind din grila competențelor specifice acumulate)

7.1. General objective / Obiectivul general al disciplinei	Obtain knowledge on distributed system design, implementation, and existing platforms
7.2. Specific objectives / Obiectivele specifice	O1. Analyze the key aspects of distributed system design O2. Explore existing technologies in cloud computing O3. Test distributed applications O3. Analyze the behavior of distributed applications under various conditions

8. Content / Conținuturi*

8.1. Lecture / Curs	Teaching strategies / Metode de predare	Remarks, details / Observații
1. Introduction to distributed systems. The distributed memory model.	Discouse, conversation, teaching by example.	2 hours. [1] – lecture 1. [2] chapters 1 and 2
2-3. Cloud computing. Big Data and MapReduce	Discouse, conversation, teaching by example.	4 hours. [1] – lecture 2 and 3. [2] chapters 7 and 21
4. Failure detection.	Discouse, conversation, teaching by example.	2 hours. [1] – lecture 4
5. Time and synchronization.	Discouse, conversation, teaching by example.	2 hours. [1] – lecture 5. [2] chapter 14

6. Global states and Snapshots	Discourse, conversation, teaching by example.	2 hours. [1] – lecture 6. [2] chapter 14
7. Multicast communication.	Discourse, conversation, teaching by example.	2 hours. [1] – lecture 7
8. RPC and marshalling. Web Services.	Discourse, conversation, teaching by example.	2 hours. [1] – lecture 8
9. Leader election.	Discourse, conversation, teaching by example.	2 hours. [1] – lecture 9. [2] chapter 15
10. P2P systems. DHTs.	Discourse, conversation, teaching by example.	2 hours. [1] – lectures 10 and 11
11. Networking and routing.	Discourse, conversation, teaching by example.	2 hours. [1] – lecture 14
12. Concurrency and replication control.	Discourse, conversation, teaching by example.	2 hours. [1] – lectures 16 and 18. [2] chapters 16 and 18
13. Gossiping.	Discourse, conversation, teaching by example.	2 hours. [1] – lectures 19
14. Job scheduling.	Discourse, conversation, teaching by example.	2 hours. Course slides available at [3]

Recommended bibliography / Bibliografie

- 1) <https://courses.engr.illinois.edu/cs425/fa2013/lectures.html>
- 2) George Coulouris et al., Distributed Systems: Concepts and Design (5th Edition), ISBN-13: 978-0132143011
- 3) <http://staff.fmi.uvt.ro/~marc.frincu/teaching.html>

8.2. Seminar, lab / Seminar, laborator	Teaching/learning strategies / Metode de predare/ învățare	Remarks, details / Observații
1. Google Cloud overview Deploying and managing VMs.	Conversation, learning through collaboration and online sources. Problem analysis.	4 hours.
2. Hadoop/MapReduce. WordCount example.	Conversation, learning through collaboration and online sources. Problem analysis.	2 hours.
3. MapReduce. Image processing.	Conversation, learning through collaboration and online sources. Problem analysis.	2 hours.
4. Apache Spark.	Conversation, learning through collaboration and online sources. Problem analysis.	2 hours.
5-7. Projects	Conversation, learning through collaboration and online sources. Problem analysis.	6 hours.

Recommended bibliography / Bibliografie

1. <https://cloud.google.com>
2. https://hadoop.apache.org/docs/r1.2.1/mapred_tutorial.html
3. <http://spark.apache.org/>

9. Correlations between the content of the course and the requirements of the IT field / Coroborarea conținuturilor disciplinei cu așteptările reprezentanților comunității epistemice, asociațiilor profesionale și angajatorilor reprezentativi din domeniul aferent programului

The course presents the basic concepts of distributed system design. It also introduces students to emerging technologies in cloud computing. These technologies are also used by companies relying on cloud computing and as such are correlated with today's IT realities.

10. Evaluation / Evaluare*

Activity / Tip de activitate	10.1. Evaluation criteria / Criterii de evaluare**	10.2. Evaluation methods / Metode de evaluare***	10.3. Weight in the averaged mark / Pondere din nota finală
10.4. Lecture / Curs	Key aspects in distributed system design	Oral evaluation. Presentation of a scientific paper.	60%
10.5. Seminar/ lab	Lab assignments	Oral evaluation. Student presentation. Discussion.	40%
10.6. Minimal knowledge for passing / Standard minim de performanță			
<ol style="list-style-type: none"> 1. Student should have basic understanding of distributed systems and should be able to give at least two examples of existing systems. 2. At least 2 lab assignments are required. 			

Date/ Data completării
10.10.2018

Signature (lecture) /
Semnătura titularului de curs

Signature (seminar)
Semnătura titularului de seminar

Signature (director of the department)
Semnătura directorului de departament
Conf.dr. Victoria Iordan