

SYLLABUS

1. Information regarding the programme

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	Computers and Information Technology
1.5 Study cycle	Bachelor
1.6 Study programme / Qualification	Information Engineering

2. Information regarding the discipline

2.1 Name of the discipline (en) (ro)	Cloud Computing Architecture						
2.2 Course coordinator	lect. Dr. Ing. Horea Adrian Grebla						
2.3 Seminar coordinator	lect. Dr. Ing. Horea Adrian Grebla						
2.4. Year of study	4	2.5 Semester	7	2.6. Type of evaluation	C	2.7 Type of discipline	Optional DS
2.8 Code of the discipline							

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

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1 LP
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14
Time allotment:					hours
Learning using manual, course support, bibliography, course notes					20
Additional documentation (in libraries, on electronic platforms, field documentation)					10
Preparation for seminars/labs, homework, papers, portfolios and essays					10
Tutorship					10
Evaluations					8
Other activities:					
3.7 Total individual study hours	58				
3.8 Total hours per semester	100				
3.9 Number of ECTS credits	4				

4. Prerequisites (if necessary)

4.1. curriculum	<ul style="list-style-type: none"> • Computer Networks • Databases • Web Programming
4.2. competencies	<ul style="list-style-type: none"> • Good programming skills in at least one programming language (Java, JavaScript, C#, etc).

5. Conditions (if necessary)

5.1. for the course	<ul style="list-style-type: none"> • Multimedia projector
5.2. for the seminar /lab activities	<ul style="list-style-type: none"> • Computers with internet access

6. Specific competencies acquired

Professional competencies	<ul style="list-style-type: none"> • C2.1 Describing the structure and operation of hardware, software and communication components • C4.1 Identifying and describing technologies, programming environments and various concepts that are specific to programming engineering • C4.2 Explaining the role, interaction and operation patterns of software system components
Transversal competencies	<ul style="list-style-type: none"> • CT1 Honorable, responsible, ethical behavior, in the spirit of the law, to ensure the professional reputation • CT3 Demonstrating initiative and pro-active behavior for updating professional, economical and organizational culture knowledge

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

7.1 General objective of the discipline	<ul style="list-style-type: none"> • To introduce the students to cloud computing concepts, the motivation behind migrating to the cloud and the challenges such a migration entails. • Walk through a relatable, real life use case and point out the benefits of using a public cloud provider in most commercial software endeavours.
7.2 Specific objective of the discipline	<ul style="list-style-type: none"> • Become familiar with Amazon Web Services core offerings. • Get hands on experience in developing cloud native applications .

8. Content

8.1 Course	Teaching methods	Remarks
1. Introduction to the cloud landscape <ul style="list-style-type: none"> • Basic concepts, types • Motivation • Providers • Pricing models 	Exposure: description, explanation, examples, debate	

<ul style="list-style-type: none"> • Layout and topology (regions, availability zones) 		
2. The IaaS model <ul style="list-style-type: none"> • Virtual machines • Images • Storage mechanisms (block, file) • Backups 	Exposure: description, explanation, examples, debate	
3. Cloud networking <ul style="list-style-type: none"> • Private cloud networks • Firewalls and access lists • Network address translation 	Exposure: description, explanation, examples, debate	
4. Scalability <ul style="list-style-type: none"> • Vertical vs Horizontal • Load balancing • Auto-scaling 	Exposure: description, explanation, examples, debate	
5. Web capabilities <ul style="list-style-type: none"> • Static website hosting • Content distribution • (Dynamic) Domain name servers 	Exposure: description, explanation, examples, debate	
6. Availability, disaster recovery <ul style="list-style-type: none"> • Resilience • Multi-AZ deployments • Disaster recovery strategies 	Exposure: description, explanation, examples, debate	
7. Infrastructure security <ul style="list-style-type: none"> • Users, roles, permissions 	Exposure: description, explanation, examples, debate	
8. The PaaS model <ul style="list-style-type: none"> • Managed runtimes • Container basics • Docker 	Exposure: description, explanation, examples, debate	
9. Managed databases <ul style="list-style-type: none"> • Relational • Key-value (Redis, S3) • Document (Mongo) 	Exposure: description, explanation, examples, debate	
10. Application security <ul style="list-style-type: none"> • OAuth • Identity providers 	Exposure: description, explanation, examples, debate	
11. Integration services <ul style="list-style-type: none"> • Queues • Pub-sub topics • Email services 	Exposure: description, explanation, examples, debate	
12. Serverless <ul style="list-style-type: none"> • FaaS • Specific databases (Dynamo, Aurora) 	Exposure: description, explanation, examples, debate	
13. API Design	Exposure: description,	

<ul style="list-style-type: none"> • REST • API Gateways 	explanation, examples, debate	
14. Recap and closing	Exposure: description, explanation, examples, debate	

Bibliography

1. Thomas Erl, Ricardo Puttini, Zaigham Mahmood - Cloud Computing: Concepts, Technology & Architecture, Prentice Hall, 1st edition, 2013
2. Thomas Erl , Robert Cope, Amin Naserpour - Cloud Computing Design Patterns, Prentice Hall, 1st edition, 2015
3. Cornelia Davis - Cloud Native Patterns: Designing change-tolerant software, Manning Publications, 1st edition, 2019
4. Michael J. Kavis - Architecting the Cloud: Design Decisions for Cloud Computing Service Models, Wiley, 1st edition, 2014
5. Kief Morris - Infrastructure as Code: Managing Servers in the Cloud, O'Reilly, 1st edition, 2016
6. Christopher Barnatt - A Brief Guide to Cloud Computing, Robinson Press; 1st edition, 2010
7. Andrew S. Tanenbaum, Maarten van Steen - Distributed Systems: Principles and Paradigms, Pearson Prentice Hall, 3rd edition, 2017

8.2 Seminar / laboratory	Teaching methods	Remarks
<ol style="list-style-type: none"> 1. Introduction to the cloud landscape <ul style="list-style-type: none"> • Regions • Azs • AWS Management Console 	Presentation, Dialogue, Case studies	
<ol style="list-style-type: none"> 2. IaaS basics <ul style="list-style-type: none"> • EC2 instances • User data • Key pairs • AMI 	Presentation, Dialogue, Case studies	
<ol style="list-style-type: none"> 3. Cloud networking <ul style="list-style-type: none"> • VPCs • Security groups • Auto-scaling groups • Load balancers • Website hosting 	Presentation, Dialogue, Case studies	
<ol style="list-style-type: none"> 4. PaaS basics <ul style="list-style-type: none"> • Docker • ECS • RDS 	Presentation, Dialogue, Case studies	
<ol style="list-style-type: none"> 5. Integration services <ul style="list-style-type: none"> • SQS • SNS • SES • Cognito 	Presentation, Dialogue, Case studies	
<ol style="list-style-type: none"> 6. Serverless <ul style="list-style-type: none"> • Lambda • API Gateway 	Presentation, Dialogue, Case studies	

7. Project grading and evaluation	Presentation, Dialogue, Case studies	
Bibliography		
<ol style="list-style-type: none"> 1. Andreas Wittig, Michael Wittig - Amazon Web Services in Action, Manning Publications, 1st edition, 2015 2. Bert David - AWS: Amazon Web Services Tutorial for Beginners, Independently published, 1st edition, 2018 3. AWS Educate - https://aws.amazon.com/education/awseducate/ 4. AWS API Gateway - https://aws.amazon.com/api-gateway/ 5. AWS SQS - https://aws.amazon.com/sqs/ 		

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

- Similar courses exist in the studying program of major universities in Europe and abroad.
- The software organisations recognize the importance of the concepts discussed during this course

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Know the applied technologies taught during the course	Colloquium	50%
10.5 Seminar/lab activities	Be able to implement course concepts and presented technologies	Test	50%
10.6 Minimum performance standards			
<input type="checkbox"/> At least grade 5 (from a scale of 1 to 10) at both presentation and laboratory project.			

Date

19.05.2022

Signature of course coordinator

lect. Dr. Ing. Horea Adrian Grebla

Signature of seminar coordinator

lect. Dr. Ing. Horea Adrian Grebla

Date of approval

24.05.2022

Signature of the head of department

Prof. dr. Laura Dioşan

