SYLLABUS

1. Data about the program of study

1.1 Institution	The Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Automation and Computer Science
1.3 Department	Computer Science
1.4 Field of study	Computer Science and Information Technology
1.5 Cycle of study	Master
1.6 Program of study/Qualification	Data Science / Master
1.7 Form of education	Full time
1.8 Subject code	7.2

2. Data about the subject

2.1 Subject name	*Architectures of Information Systems*				
2.2 Course responsible/lecturer	Prof.Dr.Ing. Dinsoreanu Mihaela - Mihaela.Dinsoreanu@cs.utcluj.ro				
2.3 Teachers in charge of seminars/ laboratory/ project	Prof.Dr.Ing. Dinsoreanu Mihaela - Mihaela.Dinsoreanu@cs.utcluj.ro				
2.4 Year of study	1	2.5 Semester	2	2.6 Type of assessment (E – exam, C – colloquium, V – verification)	E
2.7 Subject category	Formative category: DA – advanced, DS – speciality, DC – complementary				DA
	Optionality: DI – imposed, DO – optional (alternative), DF – optional (free choice)				DO

3. Estimated total time

3.1 Number of hours per week	3	of which:	Course	2	Seminars	0	Laboratory	1	Project	0
3.2 Number of hours per semester	42	of which:	Course	28	Seminars	0	Laboratory	14	Project	
3.3 Individual study:									
(a) Manual, lecture material and notes, bibliography									20
(b) Supplementary study in the library, online and in the field									20
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays									10
(d) Tutoring									5
(e) Exams and tests									3
(f) Other activities:									

3.4 Total hours of individual study (suma (3.3(a)…3.3(f)))	58
3.5 Total hours per semester (3.2+3.4)	100
3.6 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 Curriculum	Software Design
4.2 Competence	Design Patterns, Software architectures

5. Requirements (where appropriate)

5.1. For the course	Attending min 50% of the lectures to be admitted to take the final exam
5.2. For the applications	Compulsory attendance of 100% to be admitted to take the final exam

6. Specific competence

6.1 Professional competences	1. Development of advanced techniques, methods and methodologies in the domains of software design, programming systems and environments and their applications . 2. Contextual integration and exploitation of dedicated information systems. 3. Creative pooling of multidisciplinary knowledge in the field of computers and information technology for research, design, optimization, implementation and testing of theories, algorithms and original methods specific to artificial intelligence and computer vision systems.

6.2 Cross competences	1. Proof of knowledge for the economic, ethical, legal and social context associated with the profession, for correct task identification, schedule of activities, responsible decisions, with the final goal the design, preparation and presentation of a scientific paper. 2. Exercising the skill of continuous self-education and demonstrating critical, innovative and research abilities.

7. Discipline objective (as results from the *key competences gained*)

7.1 General objective	The main objective of this discipline is to provide specific information and to prepare students for designing and building solutions based on cloud native data, machine learning platforms and multicloud tools.
7.2 Specific objectives	To achieve these general objectives, students will learn how to: • Design modern and secure cloud native or hybrid data analytics and machine learning platform • Consolidate enterprise data in a governed, scalable, and resilient data platform • Democratize access to enterprise data and govern how business teams extract insights and build AI/ML capabilities • Use streaming pipelines to enable decisions making in real time • Build an MLOps platform to move to a predictive and prescriptive analytics approach

8. Contents

8.1 Lectures	Hours	Teaching methods	Notes
Introduction to Data Lifecycle	2		
Designing Data architectures – Principles, Concepts, Technologies	2		
Architecting Data Lakes	2		
Enterprise Data Warehouse	2		
Converging to Lakehouse	2		
Architecting for streaming – Streaming Ingest	2	Oral presentation, ppt support, discussions	
Stream analytics	2		
Continuous Intelligence through ML	2		
Cloud Architectures	2		
Multicloud	2		
Edge Computing	2		
ML application architectures	2		
ML platform architectures	2		
Final review	2		

Bibliography

1. Marco Tranquillin, Valliappa Lakshmanan, Firat Tekiner, Architecting Data and Machine Learning Platforms, 2023, ISBN: 9781098151614
2. David Ping, The Machine Learning Solutions Architect Handbook: Create machine learning platforms to run solutions in an enterprise setting, 2022, ISBN: 978-1801072168
3. Joe Reis, Matt Housley, Fundamentals of Data Engineering: Plan and Build Robust Data Systems, 2022, ISBN: 9781098108304

8.2 Applications – Seminars/Laboratory/Project	Hours	Teaching methods	Notes
Data environment setup	1		
Data modelling	1		
Data lakes	1		
Data warehouse	1		
Lakehouse	1	Oral presentations, hands-on lab, discussions	
Streaming environment setup	1		
Stream analytics	1		
Continuous learning	1		
Cloud architecture	1		
Multicloud	1		

Edge computing	1			
ML application architecture	1			
ML platform architecture	1			
Final review and discussions	1			

Bibliography

1. Marco Tranquillin, Valliappa Lakshmanan, Firat Tekiner, Architecting Data and Machine Learning Platforms, 2023, ISBN: 9781098151614
2. David Ping, The Machine Learning Solutions Architect Handbook: Create machine learning platforms to run solutions in an enterprise setting, 2022, ISBN: 978-1801072168
3. Joe Reis, Matt Housley, Fundamentals of Data Engineering: Plan and Build Robust Data Systems, 2022, ISBN: 9781098108304

Se vor preciza, după caz: tematica seminariilor, lucrările de laborator, tematica și etapele proiectului.

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

10. Evaluation

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	The ability to solve domain specific problems Attendance, (inter)activity during class hours	Written Exam, activity during class hours	50%
Seminar			
Laboratory	Lab tasks completion Attendance	Lab activity grading	50%
Project			
Minimum standard of performance: Lab grade >=5, Course evaluation grade >=5			

Date of filling in:	**Titulari**	**Titlu Prenume NUME**	**Semnătura**
	Curs	Prof.Dr.Ing. Dinsoreanu Mihaela	
	Aplicații	Prof.Dr.Ing. Dinsoreanu Mihaela	

Date of approval in the department 20.02.2024	Head of department Prof.dr.ing. Rodica Potolea
Date of approval in the Faculty Council 22.02.2024	Dean Prof.dr.ing. Mihaela Dinsoreanu