NAME OF THE COURSE	Distributed and non-relational databases					
Code	PMIH12	Year of study	1 and 2			
Course teacher	Marko Rosić, PhD Full Professor	Credits (ECTS)	5			
Associate teachers	Tonći Dadić , PhD Senior lecturer	Type of instruction (number of hours)	L	S	E	F
			30		30	
Status of the course	Elective	Percentage of application of e-learning	30			
COURSE DESCRIPTION						
Course objectives	Understand data distribution mechanisms and data functions that enable the use of Commodity servers for highly reliable database systems with large amounts of data that are resistant to system failures (Fault tolerance).					
Course enrolment requirements and entry competences required for the course	Relational database basics					
Learning outcomes expected at the level of the course (4 to 10 learning outcomes)	1. Describe the management of a shared data in distributed databases 2. Describe three program levels in the client-server model 3. Evaluate simple strategies for executing distributed queries in order to select a strategy that minimizes data flow 4. Explain the operation of two phases commit protocols in database systems distributed over multiple nodes 5. Explain the techniques used for fragmentation, replication and data allocation in the design of a distributed database 6. Explain the application of alternative search strategies 7. Analyze the similarities and differences between relational and non-relational databases 8. Analyze and compare types of non-relational databases 9. Use a non-relational database to store and search large amounts of data					
Course content broken down in detail by weekly class schedule (syllabus)	**Chapter I: Introduction to NoSQL** 1. History of the concept and main properties of NoSQL databases 2. Design and terminology of NoSQL databases 3. Classification and evaluation of NoSQL databases **Chapter II: Key-Value Bases** 4. Main properties of Key-Value databases 5. Key-Value bases in large organizations 6. Cases of using Key-Value databases 7. Criteria for selection of Key-Value databases with respect to application 8. Oracle NoSQL **Chapter III: NoSQL column-oriented databases or Google Bigtable clones** 9. Main properties of the column-oriented base 10. Column-oriented databases in large organizations 11. Cases of using column-oriented databases 12. Column-oriented base selection criteria with respect to application 13. Cassandra **Chapter IV: NoSQL Document Bases** 14. Common properties of document databases 15. Document bases in large organizations 16. Cases of using document databases 17. Criteria for selection of the document base with regard to the application 18. MongoDB **Chapter V: Graph and Oriented NoSQL Databases** 19. Common properties of graph-oriented NoSQL databases					

	20. Graph oriented base in large organizations 21. Cases of using graph-oriented databases 22. Criteria for selection of graph bases with respect to application 23. Neo4j and Neo Technologies Chapter VI: Search Software 24. Common browser properties 25. Search engines in large organizations 26. Cases of using a browser 27. Types of search engines 28. Elasticsearch **Chapter VII: Hybrid NoSQL Databases** 29. Common properties of hybrid NoSQL databases 30. Hybrid bases in large organizations 31. Cases of using hybrid bases 32. The most well-known hybrid base systems 33. MarkLogic (commercial version; not included in the exercises) **Chapter VIII: Conclusion** 34. Advantages and disadvantages of NoSQL database system over RDBMS 35. NoSQL misconceptions 36. Reasons why NoSQL databases are accepted in the programming community

Format of instruction	X <u>lectures</u>
	   seminars and workshops
	X <u>exercises</u>
	☐ on line in entirety
	   partial e-learning
	☐ field work
		☐ independent assignments
		☐ multimedia
		☐ laboratory
		☐ work with mentor
		☐ homework assignments

Student responsibilities	Lecture attendance 70%, exercise attendance 70%, ssignments, 2 tests, a written and oral exam. Students who successfully complete colloquia, may attend the oral exam.

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*	Name	Ects	Name	Ects	Name	Ects
	Class attendance	1.5	Research			
	Experimental work		Report			
	Essay		Seminar essay		Homework	0.5
	Tests		Oral exam	1.5		
	Written exam	1.5	Project			

Grading and evaluating student work in class and at the final exam	Student activity in lectures and exercises (attendance at lectures and exercises, solving homework assignments) (20%). Written part of the exam (40%): Two colloquia are held in the semester. Each of them is scored on a scale of 0-50 points. Students who achieve at least 25 points from each colloquium are exempt from the written exam. Other students take the written part of the exam, which corresponds in content to the colloquia. The oral part of the exam (40%) is mandatory for all students, answering three questions randomly selected from a list of 50 questions divided into three categories. The final grade is performed on the basis of all the above grades with weighting factors as indicated in parentheses for each form of assessment.

	Title	Number of copies in the library	Availability via other media
Required literature (available in the library and via other media)	T. Dadić: „Lecture notes"	0	
	[1] Dave Segleau: Oracle NoSQL Database, Overvew & Use Cases, Oracle, 2015.	0	
	[2] MongoDB NoSQL Document Database, Tutorialspoint, 2017.	0	
	[3] Even Hewitt: Cassandra, the Definitive Guide, O' Reilly, 2011.	0	
Optional literature (at the time of submission of study programme proposal)			
Quality assurance methods that ensure the acquisition of exit competences	Conversations with students, anonymous student survey, exam performance, self- analysis.		
Other (as the proposer wishes to add)			