Specification for the book of courses

Study program	Electrical Engineering and Computer Science		
Module	Computing and Informatics		
Type and level of studies	Undergraduate Academic Studies		
The name of the course	Databases		
Lecturer (for lectures)	Stoimenov V. Leonid, Stanimirović S. Aleksandar		
Lecturer/associate (for exercises)	Stanimirović S. Aleksandar, Bogdanović D. Miloš, Veljković Ž. Nataša, Frtunić-Gligorijević B. Milena		
Lecturer/associate (for OFE)	Bogdanović D. Miloš, Veljković Ž. Nataša, Frtunić-Gligorijević B. Milena		
Number of ECTS	6	**Course status (obligatory/elective)**	Obligatory

Prerequisites	
Course objectives	Gaining fundamental knowledge necessary to design, implementation and usage of databases. Learning practical knowledge regarding the database design using Entity-relationship model, implementation of relational databases and learning SQL language.
Course outcomes	Theoretical and practical knowledge of database design and data models (ER, EER, UML). Theoretical and practical knowledge of relational data model, database implementation, relational algebra and relational algebra queries. Practical knowledge about SQL query language, implementation, manipulation, storing, quering and searchng data in relational databases.
Course outline	
Theoretical teaching	1. Introduction to databases: basic concepts (data, information, database, database management system, database system, database applications), conventional processing and processing based on databases, database users. 2. Data models: levels of abstraction in DBMSs, the concept of data model and its components, process of database design using data models. 3. Conceptual design of databases, concepts of (E)ER data model, database design using (E)ER model, exaples of (E)ER database design. 4. Relational model: concepts of the relational model, structural and integrity component, relation scheme, relation entity, relation key, constraint specification, SQL DDL commands, mapping (E)ER to relational model. 5. Relational algebra: relational algebra, relational algebra operations, relational algebra queries, examples of queries, copmaprision of SQL and relational algebra queries. 6. Functional dependencies: definition of a functional dependency, rules of derivation for functional dependencies, closure of a set of functional dependencies. 7. Relation schema analysis: analysis process and the quality of the designed database, anomalies in poorly designed databases, relation decomposition in normalization and properties. 8. Normalization: the purpose of normalization and normal forms, normal forms definitions and testing (first, second, third and Boyce-Codd's normal form), normalization process. 9, Introduction to transactional processing: the concept of transaction, ACID properties of transactions, DBMS level transactions. 10. Database system architecture, overview: monolithic systems, multiuser systems, client-server systems, two- and three-layer architectures, parallel/distributed server database, data fragmentation.
Practical teaching (exercises, OFE, study and research work)	1. ER diagrams (entities, relationships, attributes), tutorial: database design using ER model 2. Translating ER model to a relational model, examples 3. SQL DDL commands (CREATE TABLE command, data types), creating tables according to relational model. 4. Queries and SQL SELECT command (basic command form, merging tables, advanced command form), 5. SQL command for updating (INSERT, UPDATE, DELETE), 6. SQL commands for working with views and indexes, 7. ADO.NET (library architecture, Connection, Command, DataReader, DataAdapter, DataSet, parameterized queries, transactions), Homework: designing a database based on given requests by using the (E)ER model, Project: realization of a database application by using ADO.NET library
Textbooks/references	
1	R. Emasri, S. Navathe, Fundamentals of Database Systems, Pearson; 7 edition (2016), ISBN-13: 9780133970777

2	L. Stoimenov, Introduction to Databases (in Serbian), University of Niš, Faculty of Electronic Engineering, 2013/2014, ISBN (e-print) 978-86-6125-099-6, ISBN (Print): 978-86-6125-111-5
3	S. Djordjevic-Kajan, L. Stoimenov, Labwork preparation for Data Structures and Databases, II part: DATABASES, Faculty of Electronic Engineering Nis.
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Number of classes of active education per week during semester/trimester/year				
Lectures	**Exercises**	**OFE**	**Study and research work**	**Other classes**
2	2	1	0	0
Teaching methods	Lectures, auditory exercises, laboratory exercises. Individual work for homework and projects			

Grade (maximum number of points 100)			
Pre-exam duties	**Points**	**Final exam**	**Points**
Activity during lectures		**Written exam**	
Exercises	20	**Oral exam**	40
Colloquia	40		
Projects			