

## Incoming student mobility

Name of UNIOS University Unit: DEPARTMENT OF MATHEMATICS

### COURSES OFFERED IN FOREIGN LANGUAGE FOR ERASMUS+ INDIVIDUAL INCOMING STUDENTS

Department or Chair within the UNIOS Unit	Department of Mathematics
Study program	<ul style="list-style-type: none"> <li>• <i>Undergraduate university study programme in Mathematics and Computer Science</i></li> <li>• <i>Undergraduate university study programme in Mathematics</i></li> </ul> <i>Graduate Mathematics and Informatics Education Study Programme</i>
Study level	Undergraduate (Bachelor) Graduate (Master)
Course title	<b>Modern Database Systems</b>
Course code	I046
Language of instruction	English
Brief course description	<p><b>Syllabus.</b></p> <ol style="list-style-type: none"> <li>1. <b>Introduction.</b> Data model. Database Management Systems. Examples.</li> <li>2. <b>Abstract Data Models.</b> Conceptual modelling of databases. Entity-relationship model. Elements of entity-relationship model. Constraints in the entity-relation model. Weak Entity Sets.</li> <li>3. <b>Logical modelling of databases.</b> Relational model of Data. Relational algebra. An algebraic query language. Constraints on relations. Functional dependencies. Design of Relational Database Schemas. Criteria for decompositions of relations. Boyce-Codd Normal Form. Third Normal Form. Multivalued Dependencies. Fourth Normal Form.</li> <li>4. <b>Relational databases.</b> Introduction to Oracle and MySQL relational database management systems. Structured Query Language (SQL). Data Definition Language. Creating, altering, and dropping of tables. Simple queries in SQL. Queries involving more than one relation. Data Manipulation Language. Insertion, modification, and deletion of data. Primary and foreign keys. Constraints on attributes and tuples. Modification of Constraints.</li> <li>5. <b>Views and Indexes.</b> Virtual views. Modifying views. Indexes in</li> </ol>

	<p>SQL. Selection of Indexes. Materialized views. SQL procedural language. Stored procedures, functions, and triggers.</p> <p>6. <b>Advanced topics in Relational Databases.</b> Object-relational data model. On-Line Analytic Processing. Query Execution. Join algorithms. Query optimization. Concurrency Control. Transactions and lock mechanisms. Parallelism in database management systems.</p> <p>7. <b>Non-Relational Databases.</b> Introduction to MongoDB document database management system. Creating, Updating, and Deleting Documents. Queries. Indexing. Aggregation. Design of Document Database. Sharing. Application and Server administration.</p> <p>8. <b>Distributed Database Systems.</b> Introduction to Hadoop distributed database management system for big data. Introduction to MapReduce. The Hadoop Distributed Filesystem. MapReduce Algorithm. Developing a MapReduce Application.</p> <p>9. <b>Special purpose databases.</b> Graph databases.</p>
Form of teaching	Consultative teaching.
Form of assessment	During lectures, advance concepts in relational and non-relational database design will be demonstrated by considering modern database systems. Practice sessions involve solving practical problems using following database management systems: Oracle, MySQL, MongoDB, and Hadoop. During the semester students solve homework problems that deal with the design and implementation of different databases. The seminar session is used for the presentation of homework solutions. Students can take written examinations. An acceptable examination and homework scores replace the final written and oral examinations. Students can also do a project to improve the final grade.
Number of ECTS	<b>9</b>
Class hours per week	<b>3+3+1</b>
Minimum number of students	
Period of realization	<b>Summer semester</b>
Lecturer	Domagoj Ševerdija