

ADVANCED DATABASES (DATABASES II)

1. GENERAL

SCHOOL			
ACADEMIC UNIT			
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	ICE-5001	SEMESTER	5th
COURSE TITLE	ADVANCED DATABASES (DATABASES II)		
INDEPENDENT TEACHING ACTIVITIES if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits	WEEKLY TEACHING HOURS	CREDITS	
Lectures	3		
Lab tutorials	1		
	4	5	
COURSE TYPE general background, special background, specialised general knowledge, skills development	Specialized in the research area. Skill development.		
PREREQUISITE COURSES:	Introduction to Databases		
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	English		
IS THE COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE WEBSITE (URL)			

2. LEARNING OUTCOMES

<p>Learning outcomes</p> <p>The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. Consult Appendix A</p> <ul style="list-style-type: none"> • Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area • Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B • Guidelines for writing Learning Outcomes <p>The aim of the course is to showcase the necessary concepts so that students are able to design and implement complex database systems using modern tools and techniques in an evolving competitive environment.</p> <p>The material aims at a deeper understanding of the design and implementation of Database Systems (DBMS) and the use of Database Management Products so that students can apply the relevant technology and select and use appropriate DBMS for the design and implementation of complex applications. Emphasis is placed on the comparative presentation of transaction support and database management administrations that existing products offer, in order for the students to acquire an overall understanding of database management and the design and implementation of transactions in the DBMs. In this sense, the course is the basis on which specific methodologies and techniques for designing and developing database systems are applied in the design and development of</p>

applications using specific products.

The main objective of the course is to equip students with the necessary knowledge so that they are able to design databases and database systems and implement databases using existing products. Moreover, the aim of the course is the application of the theory to real-life problems when designing and implementing applications that are very likely to arise during the future professional activity of the students.

Upon successful completion of the course the student:

- will have used basic tools of database technology and products,
- be able to apply techniques for designing and implementing complex databases and use known products to implement complex database systems,
- will have a good understanding of the differences between known DBMSs with respect to their support of transactions, as well as database administration,
- will have a good understanding of how to use views in database system applications,
- be able to analyze business rules to design complex databases,
- will be able to choose the DBMS that will be appropriate for any real-life problem,
- will have collaborated with his / her classmates to create and present a plan in a case study project for designing and implementing a database system.

General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology	Project planning and management
Adapting to new situations	Respect for difference and multiculturalism
Decision-making	Respect for the natural environment
Working independently	Showing social, professional and ethical responsibility and sensitivity to gender issues
Team work	Criticism and self-criticism
Working in an international environment	Production of free, creative and inductive thinking
Working in an interdisciplinary environment
Production of new research ideas	Others...

- Individual work
- Group work
- Project design and management
- Decision making

3. SYLLABUS

- Conceptual data modeling, extended Entity-Relationship model, Extended relation model, object-oriented database model, non-relational (noSQL) database models,
- System development using SQL, application development and prototype interfaces using JDBC,
- Oracle Technology (PL/SQL, triggers, stored procedures etc.),
- Open-source DBMSs,
- Comparative evaluation of database products with respect to transaction processing,

- Συγκριτική παρουσίαση Προϊόντων Διαχείρισης Βάσεων Δεδομένων σε θέματα Διαχείρισης Βάσεων Δεδομένων (Database Administration),
- Database backup and recovery,
- Concurrency control in multi-user environments,
- Indexing and query optimization,
- Distributed databases,
- New topics in the area of databases: noSQL databases, temporal databases, Spatial databases, Multimedia databases, Databases and the World Wide Web, Semi-structured databases, XML databases, Datawarehouses and OLAP systems, etc.
- Case-study project presentation.

4. TEACHING and LEARNING METHODS - EVALUATION

<p style="text-align: center;">DELIVERY <i>Face-to-face, Distance learning etc.</i></p>	Face to face												
<p style="text-align: center;">USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</p> <p>Use of ICT in teaching, laboratory education, communication with students</p>	<ul style="list-style-type: none"> • Use of advanced DBMSs: Oracle, mySQL, PostgreSQL, MS SQL Server, MongoDB • Learning support through the university on-line teaching platform • Digital support (presentations, exercises etc.) 												
<p style="text-align: center;">TEACHING METHODS</p> <p>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.</p> <p>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><i>Activity</i></th> <th style="text-align: center;"><i>Semester workload</i></th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td style="text-align: center;">39</td> </tr> <tr> <td>Tutorials</td> <td style="text-align: center;">13</td> </tr> <tr> <td>Groupwork on an advanced DBMS</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Individual study</td> <td style="text-align: center;">43</td> </tr> <tr> <td>Total Course Hours (25 hours of work per ECTS)</td> <td style="text-align: center;">125</td> </tr> </tbody> </table>	<i>Activity</i>	<i>Semester workload</i>	Lectures	39	Tutorials	13	Groupwork on an advanced DBMS	30	Individual study	43	Total Course Hours (25 hours of work per ECTS)	125
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<p style="text-align: center;">STUDENT PERFORMANCE EVALUATION</p> <p>Description of the evaluation procedure</p> <p>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</p> <p>Specifically-defined evaluation criteria are given, and if and where they are accessible to students.</p>	<p>I. Final written exam (60%) that will include:</p> <ul style="list-style-type: none"> - Short-answer questions - Problem solving questions - Comparative evaluation of theoretical concepts <p>II. Tutorial exercises (30%)</p> <p>III. Groupwork presentation (10%)</p> <p>All evaluation criteria will be posted on the course's web-page (e-class).</p>												

5. ATTACHED BIBLIOGRAPHY

- *Suggested bibliography:*

1. Hector Garcia-Molina, Jeffrey Ullman, Jennifer Widom, Database Systems: The Complete Book, 2008, ISBN: 978-0131873254, Pearson; 2nd edition.
 2. Elmasri Ramez, Navathe Shamkant, Fundamentals of Database Systems, 2016, ISBN: 978-0133971118, Pearson; 7th edition.
 3. Ramakrishnan Raghu, Gehrke Joahannes, Database Management Systems, 2012, ISBN: 978-0072465631, McGraw-Hill; 3rd edition.
 4. Silberschatz A., Korth H.F., Sudarshan S., Database System Concepts, 2010, ISBN: 978-0073523323, McGraw-Hill; 6th edition.
 5. Subrahmanian V.S., Principles of Multimedia Database Systems, Morgan Kaufmann
 6. Gray J., Reuter A., Transaction Processing: Concepts and Techniques, Morgan Kaufmann
 7. Theriault M., Henney W., Oracle security, O'Reilly
 8. Gennick J., Teach yourself Oracle PL/SQL in 21 days, SAMS Publishing
 9. O'Neil B. (Ed.), Oracle data warehousing unleashed, SAMS
 10. Dorsey P., Hudicka J., Oracle design using UML & object modeling, Oracle Press
 11. Abramson I., Abbey M., Corey M., Oracle Database 12c Install, Configure & Maintain Like a Professional, Oracle Press, McGraw-Hill
 12. Meloni J., Teach Yourself PHP, MySQL and Apache, SAMS
 13. Davies A., Fisk H., MySQL Clustering, MySQL Press
 14. Bell C.A., Expert MySQL, Apress
- Research papers and technical reports from projects, chapters from diploma theses, review papers and other publications in hot topics within the area of databases and their techniques.