Prior Skills

- Being able to list the steps that make the process of software engineering.
- Being able to understand UML conceptual schemas.
- Being able to create, access and manipulate databases with SQL and relational algebra.

Requirements

- Prerequisite BD
- Pre-Corequisite DBD

Degree Competences to Which the Subject Contributes

Specific:
- CSI2.6. To demonstrate knowledge and capacity to apply decision support and business intelligence systems.
- CSI4.2. To participate actively in the design, implementation and maintenance of the information and communication systems.
- CSI4.3. To administrate databases (CES1.6).
- CT2.2. To demonstrate knowledge and capacity to apply the characteristics, functionalities and structure of data bases, allowing an adequate use, design, analysis and implementation of applications based on them.
- CT7.2. To evaluate hardware/software systems in function of a determined criteria of quality.

Generic:
- G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Teaching Methodology

In theory hours, the teacher explains the concepts relating to any of the content. The student must work these concepts and optionally suggests possible exam questions through the campus. Some concepts of some contents are not exposed by the professor but students must work materials that the teacher be published in the virtual campus.

In the lab hours, the teacher opens a questionnaire to campus or proposed to solve a problem that students must solve pairs.
LEARNING OBJECTIVES OF THE SUBJECT

1. To know the tasks, the available documentation, and tools and principles of the database administrator.
2. Being able to get the conceptual schema of a database of an information system from the physical schema.
3. Be able to design and obtain information from multidimensional databases.
4. Being able to analyze and choose the best mechanism to collect integrity constraints in the database.
5. Being able to decide which materialized views must be defined according to the expected operations.
6. Being able to decide the rates to be defined in terms of expected operations.
7. Being able to list the existing options regarding policies, methods and time optimization along with the advantages and disadvantages of each application conditions.
8. Be able to get access plan for a query according to criteria of optimization.
9. Being able to reproduce the implementation of the algorithms involved in a process tree and estimate their cost.
10. Being able to list the main parameters and options that affect concurrency and justify the effect of modifying the value.
11. Being able to list the main options and parameters that affect the recovery and justify the effect of modifying the value.
12. Being able to manage the security of the database, and specifically access control.
13. Being able to detect and correct faults in a logic design.
14. Being able to detect and solve data integration problems.
15. To be able to participate with a proactive attitude in making exercises in teams of 2 or more students, according to the roles assigned to each student that can change during the execution of the exercises.
16. Through presentations of experts, understand the importance of a good professional realization.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Laboratory classes</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Theory classes</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

Introduction

Description:
Concepts related to the administration of databases. Administrator tasks and principles that should guide their work.

Database Reverse Engineering

Description:
Conceptual schema generation from logical schema.

Design orrectness

Description:
<table>
<thead>
<tr>
<th><strong>Data integration</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Problem of heterogeneous data. Models of information integration.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Data Warehouses</strong></th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Multidimensional databases and OLAP tools.</td>
</tr>
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</table>

<table>
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<tr>
<th><strong>Physical design</strong></th>
<th></th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Materialized views. Integrity constraints.</td>
</tr>
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</table>

<table>
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<tr>
<th><strong>Indexes</strong></th>
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<table>
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<tr>
<th><strong>Algorithms</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Selection. Projection. Ordering. Join.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Optimization</strong></th>
<th></th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Stages of optimization. Estimated volumes of data. Optimization based on costs. Access plan.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Concurrency control</strong></th>
<th></th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Transactions and Isolation levels.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Files and system parameters</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>File and parameter types.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Security</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Access control.</td>
</tr>
</tbody>
</table>
Recovery

Description:
Recovery types. Backup types.

Beyond the relational model

Description:
NoSQL databases.

ACTIVITIES

Presentation

Description:
Students must prepare your computer by any of the proposed alternatives in order to perform activities that are expected of him during the course. Basically, you must have access to Moodle and Oracle.

Full-or-part-time: 2h
Theory classes: 2h

Study of introductory concepts

Description:
Study of the contents explained and proposed questions for the exam using Moodle glossary.

Specific objectives:
1, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 4h
Theory classes: 2h
Self study: 2h
Session 1: Basic SQL Queries

Description:
The students, in pairs, must answer a Moodle questionnaire that is instantly corrected through LEARN-SQL. Whenever students send the answer a question receive a rating. Students may decide to send new answers to try to improve the above. Each shipment is a new penalty.
Students will also have to answer some questions in writing.
The teacher corrected written questions and review the grade obtained by LEARN-SQL.
During the week before the test, students will have a Moodle questionnaire resolved remotely the same features with the same partner.

Specific objectives:
1

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Study of concepts related to database reverse engineering

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
2, 4, 13

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Study of concepts relating to the correctness of the design

Description:
Study of the contents explained and proposed questions for the exam using Moodle glossary.

Specific objectives:
4, 13, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h
Study of concepts related to data warehouses

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
3, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Study of concepts related to data integration

Description:
Study of the contents explained and proposed questions for the exam using Moodle glossary.

Specific objectives:
14, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Session 2: Advanced SQL queries

Description:
The students, in pairs, must answer a Moodle questionnaire that is instantly corrected through LEARN-SQL. Whenever students send the answer a question receive a rating. Students may decide to send new answers to try to improve the above. Each shipment is a new penalty.
Students will also have to answer some questions in writing.
The teacher corrected written questions and review the grade obtained by LEARN-SQL.
During the week before the test, students will have a Moodle questionnaire resolved remotely the same features with the same partner.

Specific objectives:
1, 2

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h
Study of the concepts of physical design

**Description:**
Study of the contents explained and proposed questions for the exam using Moodle glossary.

**Specific objectives:**
5, 13, 15

**Related competencies:**
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

**Full-or-part-time:** 7h
Theory classes: 2h
Self study: 5h

Session 3: Reverse engineering and database normalization.

**Description:**
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

**Specific objectives:**
2, 15

**Related competencies:**
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

**Full-or-part-time:** 4h
Guided activities: 2h
Self study: 2h

Study of concepts related to indexes

**Description:**
Study of the contents explained and proposed questions for the exam using Moodle glossary.

**Specific objectives:**
6, 15

**Related competencies:**
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

**Full-or-part-time:** 4h
Theory classes: 2h
Self study: 2h
Study of concepts related to optimization

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
7, 8, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Session 4: Design correctness

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
13

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Study of the concepts of algorithms

Description:
Study of the contents explained and proposed questions for the exam using Moodle glossary.

Specific objectives:
9

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h
Session 5: OLAP

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
3

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Session 6: Materialized views

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
5

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Session 7: Indexes

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
6

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Session 8: Costs of selections

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
9

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h
Study of concepts relating to transactions

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
10, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Session 9: Costs of queries with joins

Description:
The students, in pairs, have to solve a problem.
Students will also have to answer some written questions.
The teacher will correct all the tests.

Specific objectives:
8, 9

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Session 10: Optimization according to workload

Description:
The students, in pairs, have to solve a problem.
Students will also have to answer some written questions.
The teacher will correct all the tests.

Specific objectives:
6, 8, 9

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h
Exam

Description:
The exam will consist of two sets of questions (a set proposed by the teacher and another set proposed by students during the course). Students involved with the intensity required in the proposed questions can choose questions from both sets. The other students can only answer the set of questions proposed by the teacher.

Specific objectives:
1, 2, 3, 6, 7, 8, 10, 11, 12

Full-or-part-time: 4h
Guided activities: 2h
Self study: 2h

Review of laboratory tests

Description:
Students who need, can ask explanations or present assessment claims following established guidelines.

Full-or-part-time: 4h
Guided activities: 4h

Exam review

Description:
Students who need, can ask explanations or present assessment claims following established guidelines.

Full-or-part-time: 2h
Guided activities: 2h

Study of the concepts of security and recovery

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
11, 12, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h
Study of concepts relating to NoSQL databases

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
1, 15

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a width vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 7h
Theory classes: 2h
Self study: 5h

Session 11: Concurrency

Description:
The students, in pairs, have to solve a problem. Students will also have to answer some written questions. The teacher will correct all the tests.

Specific objectives:
10

Full-or-part-time: 2h
Guided activities: 2h

Session 12: Files and Settings

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
1, 10, 11

Full-or-part-time: 6h
Laboratory classes: 2h
Self study: 4h

Session 13: NoSQL Databases

Description:
Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.

Specific objectives:
1

Full-or-part-time: 6h
Laboratory classes: 2h
Self study: 4h
DBA presentation

Description:
Preparation of questions and writing a report.

Specific objectives:
1, 16

Related competencies:
G8. APPROPRIATE ATTITUDE TOWARDS WORK: to have motivation to be professional and to face new challenges, have a wide vision of the possibilities of the career in the field of informatics engineering. To feel motivated for the quality and the continuous improvement, and behave rigorously in the professional development. Capacity to adapt oneself to organizational or technological changes. Capacity to work in situations with information shortage and/or time and/or resources restrictions.

Full-or-part-time: 6h
Theory classes: 2h
Self study: 4h

GRADING SYSTEM

The final grade = 40% L + 40% E + 20% P

L = average of 11 laboratory tests
E = final exam
C = peer evaluation
P = average of 11 written problems

Exam: students will have (or not) the right to choose that answer questions based on their participation in the activity during the semester to propose exam questions.

The grade of the competency will be: (competence passed with excellence), B (competition surpassed the desired level), C (competition surpassed a level sufficient) or D (competition unbeaten).

The grade of the generic competency "Appropriate attitude towards work" will be decided according to the notes of the cooperative learning activities carried out and the peer evaluation.

Peer evaluation: students will have multiple partners during the semester and evaluate them. Based on these assessments, the teacher assigned the note.

BIBLIOGRAPHY

Basic:

Complementary:
RESOURCES

Hyperlink:
- https://learnsql.fib.upc.edu/moodle/