270105 - ABD - Database Administration

Coordinating unit: 270 - FIB - Barcelona School of Informatics
Teaching unit: 747 - ESSI - Department of Service and Information System Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Teaching unit Optional)
ECTS credits: 6 Teaching languages: Catalan

Teaching staff
Coordinator: - Carme Martin Escofet (martin@essi.upc.edu)

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.

Generical:
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>Total learning time: 150h</th>
<th>Hours large group: 30h</th>
<th>Hours medium group: 0h</th>
<th>Hours small group: 30h</th>
<th>Guided activities: 6h</th>
<th>Self study: 84h</th>
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<td>20.00%</td>
<td>4.00%</td>
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### Content

#### Introduction

**Degree competences to which the content contributes:**

**Description:**

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

#### Database Reverse Engineering

**Degree competences to which the content contributes:**

**Description:**

Conceptual schema generation from logical schema.

#### Design orrectness

**Degree competences to which the content contributes:**

**Description:**


#### Data integration

**Degree competences to which the content contributes:**

**Description:**

Problem of heterogeneous data. Models of information integration.

#### Data Warehouses

**Degree competences to which the content contributes:**

**Description:**

Multidimensional databases and OLAP tools.

#### Physical design

**Degree competences to which the content contributes:**

**Description:**

Materialized views. Integrity constraints.
### Indexes

**Degree competences to which the content contributes:**

**Description:**

### Algorithms

**Degree competences to which the content contributes:**

**Description:**

### Optimization

**Degree competences to which the content contributes:**

**Description:**

### Concurrency control

**Degree competences to which the content contributes:**

**Description:**
- Transactions and Isolation levels.

### Files and system parameters

**Degree competences to which the content contributes:**

**Description:**
- File and parameter types.

### Security

**Degree competences to which the content contributes:**

**Description:**
- Access control.
**Recovery**

**Degree competences to which the content contributes:**

**Description:**
Recovery types. Backup types.

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**Beyond the relational model**

**Degree competences to which the content contributes:**

**Description:**
NoSQL databases.
## Planning of activities

<table>
<thead>
<tr>
<th>Presentation</th>
<th>Hours: 2h</th>
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<tbody>
<tr>
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<tr>
<td>Theory classes: 2h</td>
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<td>Practical classes: 0h</td>
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<td>Laboratory classes: 0h</td>
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<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 0h</td>
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</table>

**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.

<table>
<thead>
<tr>
<th>Study of introductory concepts</th>
<th>Hours: 4h</th>
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<tr>
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<td>Theory classes: 2h</td>
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<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 2h</td>
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</tbody>
</table>

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

**Specific objectives:**
1, 15

<table>
<thead>
<tr>
<th>Session 1: Basic SQL Queries</th>
<th>Hours: 4h</th>
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<tr>
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<tr>
<td>Guided activities: 2h</td>
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<tr>
<td>Self study: 2h</td>
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</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Study of concepts related to database reverse engineering</th>
<th>Hours: 7h</th>
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<tbody>
<tr>
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<td></td>
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<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 0h</td>
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<tr>
<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 5h</td>
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**Description:**

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## 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

### Study of concepts relating to the correctness of the design

<table>
<thead>
<tr>
<th>Hours: 7h</th>
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<tbody>
<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 0h</td>
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<tr>
<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 5h</td>
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</table>

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

### Specific objectives:
- 4, 13, 15

### Study of concepts related to data warehouses

<table>
<thead>
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<th>Hours: 7h</th>
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<tbody>
<tr>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 0h</td>
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<tr>
<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
</tr>
<tr>
<td>Self study: 5h</td>
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### 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

### Study of concepts related to data integration

<table>
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<th>Hours: 7h</th>
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<tr>
<td>Theory classes: 2h</td>
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<td>Practical classes: 0h</td>
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<td>Laboratory classes: 0h</td>
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<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 5h</td>
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### Description:
Study of the contents explained and proposed questions for the exam using Moodle glossary.

### Specific objectives:
- 14, 15
Session 2: Advanced SQL queries

<table>
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<th>Hours: 4h</th>
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<tbody>
<tr>
<td>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.</td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>Specific objectives:</td>
<td>Self study: 2h</td>
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<tr>
<td>1, 2</td>
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Study of the concepts of physical design

<table>
<thead>
<tr>
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<th>Hours: 7h</th>
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<tbody>
<tr>
<td>Study of the contents explained and proposed questions for the exam using Moodle glossary.</td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Specific objectives:</td>
<td>Practical classes: 0h</td>
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<tr>
<td>5, 13, 15</td>
<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
<td>Self study: 5h</td>
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</table>

Session 3: Reverse engineering and database normalization.

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 4h</th>
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<tbody>
<tr>
<td>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.</td>
<td>Guided activities: 2h</td>
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<tr>
<td>Specific objectives:</td>
<td>Self study: 2h</td>
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<tr>
<td>2, 15</td>
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Study of concepts related to indexes

<table>
<thead>
<tr>
<th>Description:</th>
<th>Hours: 4h</th>
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<tbody>
<tr>
<td>Theory classes: 2h</td>
<td>Theory classes: 2h</td>
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<tr>
<td>Practical classes: 0h</td>
<td>Practical classes: 0h</td>
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<td>Laboratory classes: 0h</td>
<td>Laboratory classes: 0h</td>
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<tr>
<td>Guided activities: 0h</td>
<td>Guided activities: 0h</td>
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<tr>
<td>Self study: 2h</td>
<td>Self study: 2h</td>
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</table>
### Description:
Study of the concepts explained and proposed questions for the exam using Moodle glossary.

### Specific objectives:
- 6, 15

<table>
<thead>
<tr>
<th>Study of concepts related to optimization</th>
<th>Hours: 7h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.</td>
<td>Practical classes: 0h</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Laboratory classes: 0h</td>
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<td>Guided activities: 0h</td>
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<td>Self study: 5h</td>
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<thead>
<tr>
<th>Session 4: Design correctness</th>
<th>Hours: 4h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Guided activities: 2h</td>
</tr>
<tr>
<td>The students, in pairs, have to solve a problem.</td>
<td>Self study: 2h</td>
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<tr>
<td>Students will also have to answer some written questions.</td>
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<tr>
<td>The teacher will correct all the tests.</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td>13</td>
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<table>
<thead>
<tr>
<th>Study of the concepts of algorithms</th>
<th>Hours: 7h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 2h</td>
</tr>
<tr>
<td>Study of the contents explained and proposed questions for the exam using Moodle glossary.</td>
<td>Practical classes: 0h</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td>Laboratory classes: 0h</td>
</tr>
<tr>
<td>9</td>
<td>Guided activities: 0h</td>
</tr>
<tr>
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<td>Self study: 5h</td>
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</table>
### Session 5: OLAP

**Hours:** 4h  
Guided activities: 2h  
Self study: 2h

**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

### Session 6: Materialized views

**Hours:** 4h  
Guided activities: 2h  
Self study: 2h

**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

### Session 7: Indexes

**Hours:** 4h  
Guided activities: 2h  
Self study: 2h

**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

### Session 8: Costs of selections

**Hours:** 4h  
Guided activities: 2h  
Self study: 2h

**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
| **Study of concepts relating to transactions** | **Hours:** 7h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 5h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Study of the contents explained and self-study materials. Resolution of exercises and proposed questions for the exam using Moodle glossary.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>10, 15</td>
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</tbody>
</table>

| **Session 9: Costs of queries with joins** | **Hours:** 4h  
Guided activities: 2h  
Self study: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>8, 9</td>
</tr>
</tbody>
</table>

| **Session 10: Optimization according to workload** | **Hours:** 4h  
Guided activities: 2h  
Self study: 2h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>6, 8, 9</td>
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</table>

| **Exam** | **Hours:** 4h  
Guided activities: 2h  
Self study: 2h |
<table>
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<tr>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>1, 2, 3, 6, 7, 8, 10, 11, 12</td>
</tr>
</tbody>
</table>
### Review of laboratory tests

**Hours:** 4h  
Theory classes: 0h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 4h  
Self study: 0h

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

### Exam review

**Hours:** 2h  
Theory classes: 0h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 2h  
Self study: 0h

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

### Study of the concepts of security and recovery

**Hours:** 7h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 5h

**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

### Study of concepts relating to NoSQL databases

**Hours:** 7h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 5h

**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

### Session 11: Concurrency

**Hours:** 2h
- Guided activities: 2h
- Self study: 0h

**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.

### Session 12: Files and Settings

**Hours:** 6h
- Theory classes: 0h
- Practical classes: 0h
- Laboratory classes: 2h
- Guided activities: 0h
- Self study: 4h

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

### Session 13: NoSQL Databases

**Hours:** 6h
- Theory classes: 0h
- Practical classes: 0h
- Laboratory classes: 2h
- Guided activities: 0h
- Self study: 4h

**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
**DBA presentation**

**Hours:** 6h  
Theory classes: 2h  
Practical classes: 0h  
Laboratory classes: 0h  
Guided activities: 0h  
Self study: 4h

**Description:**  
Preparation of questions and writing a report.

**Specific objectives:**  
1, 16

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**Qualification 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:


Others resources:

Hyperlink

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