UAB

Universitat Autònoma de Barcelona

2019/2020

Non-Relational Databases

Code: 104351
ECTS Credits: 6

Degree	Type	Year	Semester
2503758 Data Engineering	OB	2	2

Contact

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Use of Languages

Principal working language: catalan (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Oriol Ramos Terrades

Prerequisites

It is recommended to have taken the relational database course.

Objectives and Contextualisation

This course introduces the basic concepts of non-relational databases and distributed databases. The main objective is to provide the student with the tools necessary to design and use these data storage systems.

KNOWLEDGE: At the end of the course the student must be able to:

- Designing non-relational databases that are appropriate to the data to be processed.
- Design and configure data processing infrastructures according to certain requirements.
- Do queries on databases.

SKILLS: It is intended that the students acquire the following abilities:

- To gather and to interpret relevant data (usually within their area of study) to issue judgments that include a reflection on relevant social, scientific or ethical issues.
- To cooperatively work, in complex or uncertain environments and with limited resources, in a multidisciplinary context, assuming and respecting the role of the different members of the team.
- To prevent and to solve problems, to be able to adapt to unforeseen situations and make decisions.
- To write technical reports of a database.

To work with previous skills with non-relational DBMS, such as MongoDB.

Competences

- Conceive, design and implement efficient and secure data storage systems.
- Handle large volumes of heterogeneous data.
- Prevent and solve problems, adapt to unforeseen situations and take decisions.
- Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
- Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.

Learning Outcomes

1. Design and configure data-processing infrastructures on the basis of particular requirements.
2. Design relational or non-relational databases suited to the data to be processed.
3. Perform queries on databases.
4. Prevent and solve problems, adapt to unforeseen situations and take decisions.
5. Students must be capable of collecting and interpreting relevant data (usually within their area of study) in order to make statements that reflect social, scientific or ethical relevant issues.
6. Work cooperatively in complex and uncertain environments and with limited resources in a multidisciplinary context, assuming and respecting the role of the different members of the group.
7. Write technical reports on a database.

Content

1. BD object-oriented and non-relational.

- Basic concepts of object orientation.
- Identity and structure of an object.
- Encapsulation of operations, methods and persistence.
- Introduction to non-SQL databases: definition, features and types.

2. MongoDB:

- Basic concepts.
- Features.
- Introduction to JSON from MongoDB.
- Operations: insert, import, export, find, update, delete, aggregations.
- Implementation in java.

3. Physical design and refining of BD:

- MongoDB: WiredTiger.
- Data storage.
- Indexing.
- Hashing.

4. Distributed BDs:

- Basic concepts.
- Techniques of fragmentation, replication and allocation of data.
- Types of distributed BD systems.

- DDB in MongoDB.

5. Other NoSQL:

- Cassandra.
- Bigtable
- AllegroGraph.

Methodology

In this course we will follow a flipped class methodology. In this methodology, the study of the theoretical contents must be done before the face-to-face sessions, and as autonomous activities of the students, from material and documentation that will have access to the students through the virtual campus. The face-to-face classes turn into practical exercises resolution sessions and project execution, aimed at solving all the doubts and problems that have been encountered throughout the week.

There will be two types of activities: theory and project activities. The theory activities will be aimed at consolidating the most theoretical aspects of the subject. A part of them will be individual while others will be done in work groups. The project will be an essentially practical group activity that will be carried out throughout the course and will help to consolidate the theoretical aspects worked in the classroom.

The work groups will be groups of 4 students, will be formed on the first day of class and will remain stable throughout the course. They will be the same for group theory activities and the project.

Not counting the hours that should be devoted to preparing the partial exams. An average load of 9 hours per week and a student distributed in the following activities has been calculated:

- Previous work: an average of 2 hours per week is estimated which will have to be devoted to reading or visualizing the material that will beworked on in the sessions.
- Project development: an average of 3 hours per week is estimated and a member of the group that will have to dedicate to do the project in addition to the hours that are dedicated in time to the sessions dedicated to the resolution of problems and project.
- Problem solving and project: the weeks with less workload devoted to the project will be devoted to making more exercises resolutions and problems of the issues worked in the face-to-face sessions.

Cross-disciplinary competences: In this course, the competences must be worked on T01 - Work cooperatively, in complex or uncertain environments with limited resources, in a multidisciplinary context, assuming and respecting the role of the different members of the team and T05 - Preventing and solving problems, adapt to unforeseen situations and make decisions. These will be worked throughout the course in all the activities that they have to do but with more intensity in the resolution of problems and project.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
inclass sessions	26	1.04	1, 3, 5
Type: Supervised			
Problem solving and project	24	0.96	2, 4, 7, 6
Type: Autonomous			
Previous work	26	1.04	2, 1, 4, 5, 7

Study and preparation of partial tests	20	0.8	2, 1, 3, 5, 7
project developement	39	1.56	1, 3, 4, 7, 6

Assessment

The evaluation will be done on a continuous basis. There will be two individual theoretical and practical tests in writing, with a weight of 50% each on the final note. The first test (Par1) will be done approximately in the middle of the semester and the second test (par2) will be done at the end of the semester.

Recovery test: In case the Note Theory does not reach the approved, students may submit to a recovery exam on all the contents covered in the theory class.

Most weeks there will be the possibility to deliver activities worked during the week. The delivery is optional and can be done until hours set in advance in the Virtual Campus. With 50% of the maximum possible score you can reach the maximum score (1 point) of this activity (NPrb). The note will be obtained from cross-correction activities between students who are qualified for each delivery.

Cross-proofing (captive) fixes are optional and may be made by students who have handed over the problems exercises. Students will be able to obtain a maximum of a point from this activity that will be added to the theory note whenever the minimum mark in all the partial ones has been reached.

The note of the project will be out of the average of the notes obtained in each delivery. The note of each delivery will be done by making the arithmetic mean of a group note and one individual. Each of the deliveries will be approved each time. In case of suspending any delivery, the option of recovering the suspended part will be given. The note of the recovery will be a maximum of 5.

QUALIFICATION INDICATORS:

The final grade of the subject is calculated as follows:

- Partial Note 1 = Par1
- Partial Note 2 = par2
- Note Theory = 0'5 * Par1 + 0'5 * par2 + NPrb + override
- Project Note = average of all deliveries
- FINAL NOTE ASIGNATURA = 0'5 * Note Theory + 0'5 * Project Note

EVALUATION CRITERIA

- In order to account for the problem notes (NPrb) you have to obtain a minimum of 4 in the mean of the partial: = 0'5 * Par1 + 0'5 * par2> = 4.
- In order to count the note of deliveries of the project (PRJ) it is necessary to obtain a note greater than or equal to 5 in all the deliveries.
- In case of suspending some of the deliveries of the project the maximum note that can be obtained in the recovery is of 5.
- To consider approved either part (theory and practice) a minimum of 5 must be obtained.
- The subject will be approved if the FINAL NOTE ASIGNATURA is greater than or equal to 5.
- In the case of not reaching the minimum required in any of the evaluation activities, the numerical note of the file will be the lowest value between 4,5 and the weighted average of the notes,
- NOT EVALUABLE: If you do not present any evaluation activity.
- REPEATERS: No part approved separately (theory, project) from oneacademic year to another is validated.
- IMPORTANT FOR ALL STUDENTS: It is important to enroll in the virtual campus of the subject at Caronte (http://caronte.uab.cat), because the materials of the subject are published, the deliveries of the activities are made and the final notes of the subject.
- Granting an honorific matriculation qualification is the decision of the faculty responsible for the subject. The regulations of the UAB indicate that MH can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of MH of the total number of students enrolled.

EVALUATION CALENDAR:

- Partial Exams: schedule announced at the beginning of the semester.
- Recovery Exam: according to the academic calendar of the School of Engineering.
- Deliveries of the activities: date and time set in advance of the Caronte.
- Deliveries of the project: date and time set in advance of the Charon.
- The dates of delivery to Caronte (http://caronte.uab.cat) and may be subject to changes of programming due to adaptation to possible incidents. It will always be informed by Caronte about these changes since it is understood that it is the usual mechanism for the exchange of information between teacher and students.
- For each evaluation activity, a place, date and time of review will be indicated in which the student can review the activity with the teacher. In this context, claims may be made about the activity note, which will be evaluated by the teaching staff responsible for the subject. If the student does not appear in this review, this activity will not be reviewed later.

Notwithstanding other disciplinary measures that are deemed appropriate, and in accordance with the current academic regulations, irregularities committed by a student that can lead to a variation of the qualification will be classified by zero (0). Evaluation activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these evaluation activities to pass the subject, this subject will be suspended directly, without opportunity to recover it in the same course. These irregularities include, among others:

- the total or partial copy of a practice, report, or any other evaluation activity;
- let copy;
- present a group work not done entirely by the members of the group;
- present as material materials developed by a third party, even if they are translations or adaptations, and generally works with non-original and exclusive elements of the student;
- Have communication devices (such as mobile phones, smart watches, etc.) accessible during the theoretical-practical tests (individual exams).

The numerical note of the file will be the lowest value between 3.5 and the weighted average of the notes in the event that the student has committed irregularities in an act of evaluation (and therefore not approved by compensation). In summary: copying, or plagiarizing in any of the evaluation activities is equivalent to a suspense with a score of less than 3.5.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
1st Theory exam	0.25	2	0.08	2, 1, 3, 5, 7
2nd Theory exam	0.25	2	0.08	2, 1, 3, 5, 7
Problem delivery (NPrb)	0,1	2	0.08	2, 3, 4, 6
Project delivery	0.4	6	0.24	1, 4, 5, 7
peer correction exercises (CorPr)	0.05	3	0.12	5, 6

Bibliography

SUPPORT MATERIAL: http://caronte.uab.cat, no relational database cours.

BASIC BIBLIOGRAFY:

- NoSQL Distilled: A BriefGuidetotheEmergingWorldofPolyglotPersistence. Pramod J. Sadalage , Martin Fowler. Addison-wesley, 2013.

- MongoDB: TheDefinitiveGuide. Kristina Chodorow . O'Really , 2013.